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Final Report

Phase 1: Incidence of Exertional Heat Illness in Recruits

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Phase 1: Incidence of Exertional Heat Illness in Recruits
Final Report

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On behalf of
Department of National Defence

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Abstract

Phase 1 of this project collected data on Exertional Heat Illness (EHI) among Basic Officer, Level 2 Officer and Basic Recruit trainees at CFB St. Jean for courses completed between 27 June 1999 and 1 October 1999. Data were collected from 828 trainees and 68 staff and identified some useful tools and significant correlations using symptom questionnaires, environmental information and other data collection methods. Using the data collected, we have specific recommendations for the Canadian Forces Recruit and Training System (CFRETS) Headquarters, the Canadian Forces Leadership and Recruit School (CFLRS) in St. Jean, Supply in St. Jean, the Clinic in St. Jean, and some general recommendations to further reduce the risk of future EHI incidents. The data collected were not adequate to assess the validity of current Canadian Forces procedures and standards. It is suggested that there be a further study conducted from the beginning of May until the end of September to collect more comprehensive data.

At the same time, there was a pilot project to collect data on work-related illness and injury in the military population at CFB St. Jean. Data were collected from visits to the Clinic as well as the standard forms used in the Canadian Forces for reporting accidents and injuries. Despite significant efforts in hand-searching paper files, the quality of the data was very poor. As a result, we could not make any accurate estimate of either the incidence or severity or the resulting implications for operational effectiveness. It is critical that this study be expanded to assess the proposed new electronic information systems in a limited setting to see if they can provide useful information in the area of work related illness and injury. Accurate data is needed to guide the Canadian Forces in assessing the implications for both operational readiness and specific prevention initiatives.

Executive Summary

Exertional Heat Illness (EHI)

Phase 1 of this study collected data on Exertional Heat Illness (EHI) among Basic Officer, Level 2 Officer and Basic Recruit trainees at CFB St. Jean for courses completed between 27 June and 1 October 1999. A total of 828 trainees and 68 staff completed questionnaires at various intervals throughout the training cycle. Symptom questionnaires, environmental information and personal statistics data yielded some significant results that will help guide the Canadian Forces in the prevention of EHI.

Platoon staff and medical Clinic staff documented 41 potential Exertional Heat Illness (EHI) incidents between 6 July and 3 September 1999. Only two cases were documented by both Platoon Staff and Clinic staff. The 39 individual cases represented an incidence of 5% of the total trainee population in the study. Consistent with the literature on EHI, in about 25% of these incidents, the individual previously completed a symptom questionnaire that indicated a potential concern. There was one serious incident where a member was hospitalized for two days. There were no General Safety Accident Prevention Forms (CF 663s) or Reports on Injuries or Immediate Death Therefrom (CF 98s) completed for any of the potential cases of EHI.

Data from the final questionnaires completed at the end of course show that over 40 individuals reported either numbness in parts of the body and/or visual disturbances such as blurring or tunnel vision. This is a concern as it may indicate central nervous system involvement. The final questionnaires showed that between 34% and 56% of course members self-reported having some Exertional Heat Illness (EHI) symptoms. When individuals whose answers to the open ended questions listed symptoms that were clearly linked to EHI, the incidence rose as high as 89%.

Staffing was a significant challenge throughout the study, both in terms of on-site data collection and demands on both the Platoon and Clinic medical staff. The summer workload is high for both groups and is further complicated by postings during the summer months. Given the limitations, Phase 1 produced some useful results and provides clear direction for gaps that need to be addressed in order to increase both the quantity and quality of the EHI data and allow for a valid assessment of current standards and procedures.

From the data collected, we made specific recommendations for the Canadian Forces Recruit and Training System (CFRETS) Headquarters; the Canadian Forces Leadership and Recruit School (CFLRS), Supply, and the Clinic at CFB St. Jean; and some general recommendations to further reduce the risk of future EHI incidents.

The data collected were not adequate to assess the validity of current Canadian Forces procedures and standards. A further study is required to collect data from the beginning of May until the end of September in order produce the comprehensive data required.

Accident and Injury Data

A secondary aim of this study was to collect all accident and injury information on military personnel at Canadian Forces Base St. Jean, to document the incidence of work-related problems and identify areas where existing systems can be improved. This involved collecting data from the medical Clinic as well as from the standard Canadian Forces forms used to report accidents and injuries. Most data were not available in electronic format and groups could not easily share data. Despite significant effort in hand-searching paper files, the quality of the data did not allow any accurate estimate of either incidence or severity of work-related illness and injury. Therefore, the data did not provide useful information that would have assisted in assessing operational readiness and the focus for prevention initiatives.

Although there were 2,482 Clinic visits recorded during the study period, only 8 CF 98s (Reports on Injuries or Immediate Death Therefrom) and 43 CF 663s (General Safety Accident Prevention Forms) were completed. Further study is required to determine the reasons for the low completion rate of these reports. Results from the final platoon and staff questionnaires show that less than 2% of recruits and less than 18% of staff were aware of these forms. Perhaps the most alarming statistic is that for the one severe EHI case admitted to hospital, neither of these standard reports was completed.

This part of the study must be expanded to assess the proposed new electronic information systems in a limited setting to see if they can provide useful information in the area of work related illness and injury. Accurate data is needed to guide the Canadian Forces in assessing the implications for both operational readiness and specific prevention initiatives. The data are also essential to support current initiatives to better protect the health and wellbeing of all those serving with the Canadian Forces.

Table of Contents

Acknowledgements i

Abstract ii

Executive Summary iii
Exertional Heat Illness (EHI) iii
Accident and Injury Data iv

1. Introduction 1

1.1 Background 1

1.2 Research on Exertional Heat Illness (EHI) 2
1.2.1 Marine Corps Recruits 2
1.2.2 Signs and Symptoms 2
1.2.3 Environmental Conditions 2
1.2.3.1 WBGT 2
1.2.3.2 Humidex 3
1.2.3.3 Occupational Standards 3
1.2.4 Personal Risk Factors 3
1.2.5 Hyperhydration 4
1.2.6 Prognosis 4

1.3 Objective and Scope 4

2. Method 5

2.1 Exertional Heat Illness (EHI) 5
2.1.1 Questionnaires 5
2.1.1.1 Clinic Questionnaires 5
2.1.1.2 Pre and Post-Activity Questionnaires 6
2.1.1.3 Final Questionnaires 6
2.1.1.4 Staff Questionnaires 6
2.1.2 EHI Incidents 7
2.1.3 Environmental Conditions 7
2.1.4 Platoon Schedules 7
2.1.5 Medical Data 8
2.1.6 Personal Information 8

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2.2 Accident/Injury Information 8

2.3 Statistical Treatment 9

3. Results and Discussion 10

3.1 Exertional Heat Illness (EHI) 10
Table 1: Descriptive Data for Platoons in Study 10

3.1.1 Questionnaires 10

3.1.1.1 Clinic Questionnaires 10
Table 2: Summary of EHI Symptom Scores from Clinic Questionnaires 11
Table 3: Self-Assessed Fitness Scores at the Beginning of Training 12

3.1.1.2 Pre and Post-Activity Questionnaires 12
3.1.1.2.1 Administration 12
3.1.1.2.2 Results 12
Table 4: Summary of Symptom Scores from Pre & Post-Activity Questionnaires 13
3.1.1.2.3 Prediction of EHI 14
3.1.1.2.4 Short versus Long Questionnaires 14
Figure 1: EHI Symptom Scores for 12 Reported EHI Incidents 14

3.1.1.3 Final Questionnaire 15
3.1.1.3.1 Body Mass Index (BMI) 15
3.1.1.3.2 Physical Fitness 15
Table 5: Self-Reported Assessments of Physical Fitness & Prior Physical Activity 15
3.1.1.3.3 Knowledge of EHI 16
Table 6: Trainee Knowledge of Exertional Heat Illness (EHI) 16
3.1.1.3.4 Reporting 16
Table 7: Reporting of EHI Symptoms 16
3.1.1.3.5 EHI Training 17
3.1.1.3.6 Smoking 18
3.1.1.3.7 Scheduling 18
3.1.1.3.8 Hydration 19
3.1.1.3.9 Diet 19
3.1.1.3.10 Clothing and Equipment 20
3.1.1.3.11 Practices 20

3.1.1.4 Staff Questionnaires 20
3.1.1.4.1 Knowledge of EHI 21
Table 8: Staff Knowledge of Exertional Heat Illness (EHI) 21
3.1.1.4.2 WBGT 21
3.1.1.4.3 EHI Training and Procedures 21
3.1.1.4.4 Physical Fitness and Body Mass Index 22

3.1.1.4.5 Reporting 23
3.1.1.4.6 Staff Fitness and Smoking 23
3.1.1.4.7 Schedules 23

3.2 EHI Incidents and Medical Data 23
3.2.1 Serious Documented Incident 24

3.3 Environmental Conditions 26
Table 9: WBGT and Humidex Summary 26

3.4 Personal Information 27

3.5 Accident/Injury Information 27
3.5.1 Clinic Visits 27
3.5.2 General Safety Accident Prevention Forms (CF 663s) 28
3.5.3 Report on Injuries or Immediate Death Therefrom (CF 98s) 28
3.5.4 Summary 29

3.6 Limitations 29

3.7 Further Study 29

4. Recommendations 31
4.2 CFRETS Headquarters / DCIEM 31
4.3 CFLRS 32
4.4 St. Jean Clinic 33
4.5 Supply 34
4.6 CFB St. Jean 34
4.6 General EHI 34

5. Conclusions 35

6. Selected References 36

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7. Appendices

Typical Basic Officer Course Timetable - 8 Weeks ..... *Appendix Page 1*

Basic Recruit Training Timetable ..... *Appendix Page 2*

Clinic Questionnaire #1 ..... *Appendix Page 3*

Clinic Questionnaire #2/#3 ..... *Appendix Page 4*

Pre and Post-Activity Questionnaire ..... *Appendix Page 5*

Final Questionnaire ..... *Appendix Page 6*

Staff Questionnaire ..... *Appendix Page 9*

Environmental Data – May 1999 ..... *Appendix Page 14*

Environmental and Incident Data – June 1999 ..... *Appendix Page 15*

Environental and Incident Data - July ..... *Appendix Page 16*

Environmental and Incident Data - August ..... *Appendix Page 17*

Environmental and Incident Data - September ..... *Appendix Page 18*

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1. Introduction

1.1 Background

Human Systems Integration (HSI) is aimed at insuring the safe, effective operability and supportability of systems and equipment. One type of information required for HSI is related to the accidents or injuries sustained by military members using specific items of equipment and/or when performing specific tasks.

Currently, the General Safety Programme within DND (D Safe G) is responsible for collecting and analyzing all DND accident reports. They are extremely successful with respect to civilian reporting but only collect about 25% of all military accident reports. They are not responsible for reporting injury data to the medical authorities.

The Deputy General of Health Services (DGHS) is responsible for the health and wellbeing of all Canadian Forces (CF) personnel and as such is accountable for all medical documents. This includes the collecting, sorting and analyzing of medical data within their own system. They are not responsible for keeping or tracking accident information nor are they obliged to inform D Safe G of the occurrence of any accidents. The data are simply collected and entered into a decentralized file (as are training records, clothing docs, pers files, unit files etc), and are essentially unobtainable without significant effort involving "hand searching" of records. Compounding the situation is the lack of a formal link between the D Safe G and DGHS.

This complete lack of data sharing has left a significant gap in the CF's ability to track and analyze accidents or incidents where there is harm to the individual soldier. A recent serious case of Exertional Heat Illness (EHI) may have been prevented if this type of information was in existence. By instituting a comprehensive Canadian Forces wide accident/injury electronic database this knowledge gap can be closed.

Creation of such a database requires the co-operation of all those responsible for incident reporting and analysis. As the two main users of such a system have recently instituted programs to modernize their data collection systems it is the ideal time to ensure they work together. These stakeholders have already indicated support for such an endeavour.

Exertional Heat Illness (EHI) is a substantial problem in military operations and training, especially when sustained physical exertion is combined with hot and humid environments. In the summer of 1996, there was a fatal heat stroke incident at the Canadian Forces Leadership and Recruit School (CFLRS) at CFB St. Jean. The Canadian Forces Recruiting Education and Training System (CFRETS) therefore requested assistance from DCIEM to better assess the scope of EHI problems during basic training. The work will also provide input on the Defence Administrative Orders and Directives (DAODs), existing Canadian Forces Medical Orders (CFMOs), Canadian Forces Administrative Orders (CFAOs) and training practices.

This study also looked at the feasibility of instituting an accident/injury database focussing on Exertional Heat Illness (EHI) within the Canadian Forces Recruiting, Education and Training System (CFRETS) and collected data on all accidents and incidents resulting in injuries during this period.

1.2 Research on Exertional Heat Illness (EHI)

Exertional Heat Illness (EHI) continues to be a significant problem for military personnel involved in training and operations, especially in hot, humid environments.

1.2.1 Marine Corps Recruits

A major study with U.S. Marine Corp Recruits (Ref. 6) looked at clinic and hospital records identifying all cases of EHI occurring among 217,000 recruits (90% male, 80% age 18-20 years) entering 12-week basic training at Parris Island, SC from 1982 to 1991. There were 1,454 cases of which 89% were males and 11% females. Eleven percent of male cases were sent to hospital and no female cases were hospitalized. The majority of cases occurred from May to September, with a peak rate of 2% of recruits in summer. Most cases occurred during the cooler early morning hours when recruits performed strenuous exercise. During 0700 to 0900 hours, the rate of heat casualties increased as the Wet Bulb Globe Temperature (WBGT) index increased, beginning at levels as low as 65°F (18.3°C). Among the early morning cases of heat illness, exposure to a WBGT of over 80°F (27°C) was infrequent (25%). A WBGT reading of over 27°C was common (87%) on the day prior to illness, suggesting that heat exposure has a lasting effect.

Another study with the Marine Corps recruits looked at risk factors predicting EHI (Ref. 5). This study found an eight-fold increased risk of EHI for recruits with a body mass index (BMI) greater than 22 kg/m^2 and 1.5 mile run-time of 12 or more minutes. Only 18 percent of recruits met these criteria for high risk, but they accounted for 47% of the EHI cases during the 12-week basic training course.

Although heat acclimatization and physical training decrease the risk of heat illness, heat exhaustion is also seen in thoroughly acclimatized or well-trained individuals exercising in hot environments (Ref. 2, 9). One reason may be that the signs and symptoms of EHI are similar to the familiar sensations of fatigue or exhaustion among young, highly motivated, healthy individuals.

1.2.2 Signs and Symptoms

The signs and symptoms of Exertional Heat Illness (EHI) are often not recognized. The literature (Ref. 2, 9) indicates that most often, a previously healthy individual, involved in physical exertion in hot weather, collapses. About 25% of individuals have prior nonspecific symptoms lasting minutes to hours (as distinct from classical heat stroke) and typically confusion and/or agitation occurs. Seizures occur in over 60% of cases, especially among the physically fit. Most cases involve hyperventilation and profuse sweating (different from classical heat stroke where there is typically dry skin). The pupils are constricted to pinpoint size in about 75% of cases.

1.2.3 Environmental Conditions

1.2.3.1 WBGT

There remains some difference of opinion in the literature about the exact threshold at which environmental conditions significantly increase the risk of developing EHI. The Wet Bulb Globe Temperature (WBGT) index is a widely used heat index that measures three forms of heat load. Seventy percent of the index is derived from

the wet-bulb thermometer (T_{wb}), 20% from the unshaded or black globe thermometer (T_g), and the remaining 10% from a standard dry bulb thermometer located in the shade (T_{db}).

$$WBGT = 0.7\,T_{wb} + 0.2\,T_g + 0.1\,T_{db}$$

Typically, a WBGT reading of between 26°C to 28°C is used as the lower limit at which there is a very significant risk of EHI. However, research with the Marine Corps recruits (Ref. 6) indicates increased risk of EHI at WBGT levels as low as 18°C.

1.2.3.2 Humidex

Environment Canada weather stations report temperature (dry bulb temperature (T_{db}) in °C) and relative humidity (wet bulb temperature (T_{wb})) data. When Wet Bulb Globe Temperature (WBGT) readings are not available, the humidex can be used to estimate heat load, using the following equation:

$$Humidex = T + h$$

T is the dry bulb temperature (T_{db}) in °C and h is 5/9 (e-10), where e is the ambient vapour pressure in kPa x 10.

Humidex readings between 20 and 29 are comfortable, 30 to 39 is associated with varying degrees of discomfort, at 40 to 45 almost everyone is uncomfortable and above 46, many types of physical work must be restricted.

1.2.3.3 Occupational Standards

Most Canadian jurisdictions use Threshold Limit Values (TLVs) recommended by the American Conference of Governmental Industrial Hygienists (ACGIH) (Ref. 1). For acclimatized workers performing continuous light work, the ACGIH recommends an upper limit of 30°C temperature or an estimated humidex of 46°C. For unacclimatized workers, the permissible heat exposure TLVs are reduced to a temperature of 27.5°C and a corresponding humidex of 41°C.

1.2.4 Personal Risk Factors

Studies (Ref. 3, 4, 8, 9) show an increased susceptibility in individuals who are obese, unfit, unacclimatized to the heat, have a previous history of heat stroke, or those with a fever or diarrhoea. Other predisposing factors include dehydration, infectious disease, lack of sleep, sweat gland dysfunction, scarred skin areas, and drug effects. Gender and ethnic origin do not influence tolerance to heat. Other factors that may be linked include caffeine intake (including pill form), alcohol consumption, immunization, use of specific drugs, and diet.

However, young, healthy, physically fit and motivated individuals may be at greatest risk of EHI (Ref. 2, 9). As mentioned earlier, one reason may be that the signs and symptoms of EHI are similar to the familiar sensations of fatigue or exhaustion among young, highly motivated, healthy individuals.

1.2.5 Hyperhydration

A recent study looked at the U.S. Army fluid replacement guidelines for training in hot weather (Ref. 7). This study raised concerns about water intoxication resulting from overconsumption of water during training.

Hyponatremia results from an increase in total body water of three to five litres. The study recommended that fluid intake be limited to a maximum of 1 quart (1.4 litres) per hour and that daily fluid intake not exceed 12 quarts (11.4 litres). Individual water needs vary by .25 quarts (.24 litres) per hour. The study provides revised work/rest and hydration schedules for four hours of easy, moderate, or hard work at different WBGT readings.

1.2.6 Prognosis

The effects of EHI on the body are directly related to the length of time spent with a high body temperature (Ref. 3, 9). As EHI moves beyond the acute stage, there are changes in the blood chemistry and enzyme levels that damage the body tissues and organs. When not treated, it can rapidly progress to death.

Over 95% survival results with rapid decrease of body temperature, stopping convulsions, proper rehydration at the site of the event, and quick evacuation to a medical centre. Most fatalities are linked to misdiagnosis, inadequate treatment in the field, and delay in transfer to a medical facility (Ref. 3, 9).

Most survivors of EHI recover without any lasting effects. Some individuals, however, have a reduced tolerance to exercise-heat stress that may last for 8 to 12 weeks. An 8-12 week post-episode exercise-heat stress test is typically recommended to ensure that tolerance is back to normal, as neurological deficits may continue for 12-24 months in some individuals (Ref. 3).

1.3 Objective and Scope

All of the data were collected at Canadian Forces Base (CFB) St. Jean during the summer of 1999.

The primary objective of Phase 1 of the study was to investigate the prevalence of Exertional Heat Illness (EHI) within the Canadian Forces recruit training system. This part of the project was limited to Canadian Forces Leadership and Recruit School (CFLRS) trainees in the Basic Recruit, Basic Officer, and 2nd Level Officer courses completed between 27 June 1999 and 1 October 1999 at CFB St. Jean.

A secondary aim of this project was to collect all accident and injury information on all military personnel (including CFLRS trainees) at CFB St. Jean to document the incidence of work-related injury and illness and identify areas for improvement. We collected data from Clinic visits, General Safety Accident Prevention Forms (CF 663s), and Reports on Injuries or Immediate Death Therefrom (CF 98s) between 1 May 1999 and 30 September 1999.

2. Method

There were two distinct parts to the study. The first investigated Exertional Heat Illness (EHI) among trainees taking Basic Officer, Level 2 Officer, or Basic Recruit Training courses at the Canadian Forces Leadership and Recruit School (CFLRS) in St. Jean, that were completed between 27 June and 1 October 1999. The second tracked reported accidents and injuries among all military personnel at CFB St. Jean between 1 May 1999 and 30 September 1999.

2.1 Exertional Heat Illness (EHI)

The following groups participated in the study:

Dates	Duration (Weeks)	Course	Number of Platoons	Number in Study
27 June – 20 August	8	Basic Officer Training Course	12	397
5 July –13 August	6	Level 2 Officer Training Course	2	59
19 July - 24 September	10	Basic Recruit Training #1	3	176
26 July –1 October	10	Basic Recruit Training #2	4	196

2.1.1 Questionnaires

Based on prior research, DCIEM developed a set of 21 EHI symptom statements (and a shorter subset of nine statements). These symptom statements were then used in various self-assessment questionnaires detailed below. Members checked the box corresponding to the degree to which they experienced each specific symptom, either at the time (typically prior to an activity) or during the activity just completed. There were always the same six options for each statement (0=not at all, 1=slight, 2=somewhat, 3=moderate, 4=quite a bit, 5=extremely).

Francophone platoons received all questionnaires in the french language.

See the Appendix for an overview of the schedule for the Basic Officer and Basic Recruit courses and the questionnaires administered (Appendix Pages 1, 2).

2.1.1.1 Clinic Questionnaires

(Appendix Pages 3, 4)

Medical staff administered the questionnaires in the clinic. On the initial clinic visit, the Medical Assistant briefed each group on the study and reinforced the confidentiality of all completed questionnaires. Each member received a Canadian Forces instructional pamphlet "Heat Stress Recognition and Prevention". The clinic questionnaires asked for a self-assessment on nine symptom statements and a fitness and/or weight question.

The twelve platoons of Basic Officer Trainees completed the questionnaires when they went to the Clinic for immunization during week 1, week 3, and their final (8^{th}) week of training. The Basic Recruit platoons completed their Clinic questionnaires during scheduled immunizations in week 2, week 4, and the final (10^{th})

week of training. As the Level 2 Officer Platoons did not require immunization, the platoon staff administered the Clinic Questionnaire #1 during the first week of training.

2.1.1.2 Pre and Post-Activity Questionnaires

(Appendix Page 5)

Given the logistics of different platoon and section schedules, the platoon staff administered all pre and post-activity questionnaires. Directing staff were reminded of the "Protected A" status of completed questionnaires. Each questionnaire gave the same 21 symptom statements and members checked the box corresponding to the degree to which they experienced each specific symptom, either at the time (typically prior to an activity) or during the activity just completed.

Prior to the start of the study, staff identified the forced marches and obstacle course as among the most physically demanding activities for the Basic Officer and Basic Recruit platoons. Directing staff gave members the same 21 statement questionnaire before and after each of the required forced marches: 3K, 5K, 7K, 13K and the obstacle course. (See Appendix Pages 1, 2 for the typical weekly training timetable and study schedule.)

As the training is significantly different for Level 2 Officer training, staff identified small party taskings during week five as very demanding. Platoon staff administered five questionnaires each day (spaced throughout the day to coincide with field taskings in Farnham) for two consecutive days during week five.

2.1.1.3 Final Questionnaires

(Appendix Pages 6-8)

The civilian contractor administered the final questionnaire to all platoons during their final week of training. With all but one platoon, there was also an opportunity for discussion following completion of the questionnaire. During the session, a portable scale was used to measure each member's clothed weight.

Thirty-six true/false questions assessed knowledge of Exertional Heat Illness (EHI) symptoms, risk factors, and prevention. Using a five point scale (no, mostly no, yes&no, mostly yes, definitely yes), members responded to statements related to their personal experience during basic training. They were also asked about their level of exercise in the month prior to coming to St. Jean, smoking habits, caffeine intake, incidents when they felt closest to having EHI, and other issues they thought should be considered.

To assist with the other part of the study tracking injuries and illness, members were also asked if they knew what a CF 663 and CF 98 were and what they are used for. (The CF 663 is the General Safety Accident Prevention Form and the CF 98 is the Report on Injuries or Immediate Death Therefrom.)

2.1.1.4 Staff Questionnaires

(Appendix Pages 9-13)

A civilian staff member in the Canadian Forces Leadership and Recruit School (CFLRS) administered an anonymous confidential questionnaire to available staff in October. The content was similar to the final questionnaire given to the platoon members, but also probed personal experience with Exertional Heat Illness (EHI), incidents during the period of the study, and contributing circumstances.

2.1.2 EHI Incidents

Platoon staff and Clinic staff were asked to document any problems that might be related to Exertional Heat Illness (EHI) in the platoons participating in the study.

Staff at the Canadian Forces Leadership and Recruit School (CFLRS) developed a short form to be completed when platoon members expericnced problems that might be related to Exertional Heat Illness (EHI). It asked for identifying information, date and time, symptoms, action taken, other factors, activities, deviations from schedule, and comments. For incidents reported only at the platoon level, these individuals were treated at the platoon level and did not require treatment at the Clinic or hospital. A symptom questionnaire was not filled out at the time of the incident.

Clinic staff were asked to identify individuals from CFLRS that came in for treatment for something that might be related to EHI. The intent was to identify all members sent to the Clinic or Hospital for treatment of a potential heat-related problem. The Medical Assistant then interviewed the member within two days of the incident, collecting personal information, details of the incident, personal equipment worn, history, medical symptoms and treatment, and environmental conditions. A symptom statement questionnaire was not used as part of this interview.

2.1.3 Environmental Conditions

The Preventive Medicine Technician in St. Jean took the Wet Bulb Globe Temperature (WBGT) measures from June until September. When it was hot, WBGT readings were taken five times a day (0800, 1000, 1200, 1400 and 1530 hrs) and reported by e-mail to the various units. Specific notification was typically given when readings exceed 27°C. Staff also took WBGT readings in Farnham (where field activities are conducted) when staff were available and there were activities taking place.

As the main gym in St. Jean was identified as a potential concern, the Physical Education staff took WBGT measures in the gym during part of July and August.

Hourly temperature and relative humidity data were obtained from the closest Environment Canada weather station (L'Acadie) for the period from 1 May to 31 September.

Various standards for physical exertion in the heat were examined, both in terms of the threshold for reducing activity and specific measures to be taken to prevent Exertional Heat Illness (EHI). This included Canadian Forces Medical Orders (CFMOs), Canadian Forces Administrative Orders (CFAOs), Standard Operating Procedures (SOPs) from the Canadian Forces Leadership and Recruit School (CFLRS) in St. Jean, and First Aid instructional material.

2.1.4 Platoon Schedules

Data were gathered on the specific timetable and scheduled activities for each of the 21 platoons involved in the study. This included scheduling of classroom sessions (including training on Exertional Heat Illness), immunization, drill, physical training, field exercises in Farnham, days off, tests etc. (See Appendix Pages 1,2.)

2.1.5 Medical Data

Medical staff provided specific details on the vaccinations given to platoon members during each of the three immunization visits scheduled for the Basic Officer and Basic Recruits platoons.

The Medical Assistant gathered basic information from all Clinic visits between 27 June 1999 and 1 October 1999 (corresponding with the training periods for the Canadian Forces Leadership and Recruit School (CFLRS) groups in the study). Data recorded included the date and time of visit, identifying information, unit, duty status (duty, exercise, non-duty), lost-time, and whether a CF 98 (Report on Injuries or Immediate Death Therefrom – see 2.2) was completed.

CFLRS had the results of the recruitment physical assessment test for only a very few of the recruits in training over the summer. The Medical Assistant searched individual medical records for height and weight measurements, typically taken at the time of the recruiting medical.

2.1.6 Personal Information

The nominal role provided gender, age, province and unit information for each individual involved in the study. We also attempted to get the results of the enrolment physical fitness test given at the recruiting centres.

The Basic Officer and Level 2 Officer platoons provided information on the specific reason for an individual not completing the training course. This information was not readily available for the Basic Recruit platoons. Those who did not complete training were categorized as released (either voluntarily or due to failure), returned to unit, or having the opportunity to attend a later training course (recourse). Of specific interest were individuals who asked for a voluntary release, had medical problems during the course, or failed the physical requirements of the course.

2.2 Accident/Injury Information

For the period of 1 May 1999 to 30 September 1999, the Medical Assistant collected information on all clinic visits in St. Jean. This included all military personnel from both the Canadian Forces Leadership and Recruit School (CFLRS) and regular forces in St. Jean. Data collected included date and time of visit, identifying information, unit, duty status (duty, exercise, non-duty), lost-time, and whether a CF 98 (Report on Injuries or Immediate Death Therefrom) was completed.

We obtained information from all CF 98s (Report on Injuries or Immediate Death Therefrom) completed between 1 May 1999 and 30 September 1999. These forms are typically initiated by medical staff and completed within seven days of the injury or death. CF 98s document the: date, time, and place of the event; injured person's statement of circumstances of injury (signed and witnessed); signed statements and assessments from the Medical Officer and the Investigating Officer (if no Board of Inquiry or Summary Investigation is ordered by the Commanding Officer); and endorsement by the Commanding Officer. Veterans Affairs use the CF 98s when determining pension eligibility.

In addition, the Base General Safety Officer provided data from the General Safety Accident Prevention Forms (CF 663s) completed from 1 May 1999 to 30 September 1999. CFLRS also provided the same CF 663 information for school trainees. CF 663s are only used for accident prevention purposes. They document: date, time, duty status, witnesses, and location of accident; descriptive information on the injured person; details of the injury or material damage; sequence of events; cause factors; and corrective action. The completed 663s are signed by the Investigator, OSH (Occupational Safety and Health) Workplace Committee Representative, Branch or Section Head, General Safety Officer, and the Commanding Officer.

In the final questionnaire administered to all platoons, individuals were asked if they knew what CF 663s and CF 98s were and what they were used for. Staff questionnaires included the same question.

2.3 Statistical Treatment

Statistical analysis was performed using SPSS 9.0 for Windows. Data were analyzed using the means and standard deviations (SD) associated with each variable. All data from pre and post-activity questionnaires were analyzed using paired T-tests. A correlation matrix was developed for all variables. Significance is reported for $p < .05$.

3. Results and Discussion

3.1 Exertional Heat Illness (EHI)

Table 1: Descriptive Data for Platoons in Study

Variable	Basic Officer	Level 2 Officer	Basic Recruit #1	Basic Recruit #2
Course Length	8 weeks*	6 weeks	10 weeks	10 weeks
Start Date	27 June	5 July	9 July	26 July
Number of Platoons	12	2	3	4
Number Started in Study	397	63	176	196
Completing Course	81%	90%	70%	80%
Female	30%	34%	16%	16%
Male	70%	66%	84%	84%
Age: mean ∓ SD	18.6 ∓ 2.6	20.9 ∓ 4.0	23.1 ∓ 5.1	23.1 ∓ 4.5
Age Range	16 - 38	17 – 39	17 - 46	18 – 42
Body Mass Index (BMI): mean ∓ SD	23.2 ∓2.6	25.6 ∓ 3.4	24.2 ∓ 3.0	24.5 ∓ 3.8
BMI Range	17 – 32	19 – 35	17 - 32	18 – 33

* One platoon completed the course in 7 weeks

3.1.1 Questionnaires

There is some concern about whether the training courses were long enough to allow gradual acclimatization to physical exertion in hot, humid conditions. The shorter the training period, the greater the stress, especially for individuals with a low level of prior physical activity and physical fitness. As a result of provincial high school schedules, one Basic Officer platoon completed the course in 7 weeks.

All Platoons completed the Clinic and Final Questionnaires as scheduled. Not all Basic Officer and Basic Recruit platoons were able to collect pre and post-activity questionnaires for the Forced Marches (3K, 5K, 7K, 13K) and Obstacle Course. This is further detailed in Table 4 of Section 3.1.2.

Summary data are presented for each of the Basic Officer, Level 2 Officer, Basic Recruit #1, and Basic Recruit #2 courses.

3.1.1.1 Clinic Questionnaires

(See Appendix Pages 3, 4)

A Medical Assistant from the Clinic administered and collected all Clinic Questionnaires. During the debriefing following the Final Questionnaire, the platoons indicated they felt confident that the data from the Clinic Questionnaires would only be used for research and had no influence on their success in the course.

The clinic questionnaires asked members to self-assess how they felt over the last week based on nine Exertional Heat Illness (EHI) symptom statements. Each statement (for example, "I feel lightheaded") would be answered as "0" (not at all), "1" (slight), "2" (somewhat), "3" (moderate), "4" (quite a bit), or "5" (extreme). Composite scores for the nine symptom statements are reported as percentages ranging from 0% (never experienced any of the nine symptoms) to 100% (experienced all nine symptoms in the extreme).

Table 2: Summary of EHI Symptom Scores from Clinic Questionnaires

Course	Questionnaire	n	EHI Symptoms (Mean % ∓ SD)	Range %	n > 2SD
Basic Officer	#1	366	19.4 % ∓ 15.0 %	0 – 80.2 %	17
	#2	347	24.8 % ∓ 17.4 %	0 – 75.6 %	21
	#3	289	9.6 % ∓ 10.0 %	0 – 57.8 %	17
Level 2 Officer	#1	51	26.6 % ∓ 19.4 %	0 – 77.8 %	3
Basic Recruit #1	#1	155	22.4 % ∓ 17.2 %	0 – 80.4 %	9
	#2	145	11.0 % ∓ 10.6 %	0 – 68.8 %	5
	#3	115	6.2 % ∓ 9.2 %	0 – 37.8 %	10
Basic Recruit #2	#1	171	22.2 % ∓ 16.4 %	0 – 79.9 %	7
	#2	162	13.4 % ∓ 11.8 %	0 – 73.4 %	9
	#3	136	7.6 % ∓ 10.2 %	0 – 66.6 %	6

Scores range from 0% (never experienced any of the nine symptoms) to 100% (experienced all nine symptoms in the extreme)

The range of composite scores decreased over the three Clinic questionnaires administered ($p<.001$). This may reflect acclimatization, both to the environmental conditions and other aspects of the training environment. The data indicate that the short nine symptom statement survey may help identify individuals who are having difficulty acclimatizing and thus may initially be at increased risk of Exertional Heat Illness (EHI).

It might be expected that individuals arriving from significantly cooler and drier climates would experience more symptoms of EHI than members coming from hot and humid parts of Canada. The data however, do not support this. It may be necessary to collect more information than just home unit to help identify individuals who might need more time to acclimatize to the heat and humidity in St. Jean. For example, the recruit from Toronto might have spent most of the warm weather in air conditioned environments, while the individual from Newfoundland worked part-time in a very hot kitchen.

Members with scores more than two standard deviations above the mean did not have a greater incidence of reporting heat related problems. This is most likely the result of both individual differences in ability to reduce heat load on the body and a failure to identify and/or report potential EHI problems.

For the Basic Officer platoons, there were a significant positive correlations ($p<.01$) between the composite score on the nine item symptom questionnaires completed during the three Clinic visits and both the average Humidex for the three prior days and the composite score from symptom questionnaires completed after the 13K forced march. There were no significant correlations for the other groups.

The first Clinic Questionnaire asked members to self-assess their physical fitness level at the beginning of their training in St. Jean. The continuous scale ranged from "1" (very unfit), through "3" (moderately fit), to "5" (extremely fit).

Table 3: Self-Assessed Fitness Scores at the Beginning of Training

	Basic Officer	Level 2 Officer	Basic Recruit#1	Basic Recruit#2
Mean ∓ SD	3.4 ∓ .7	3.3 ∓ .8	3.2 ∓ .9	3.2 ∓ .9
Range	1.0 – 5.0	1.0 – 4.6	1.0 – 5.0	1.0 – 5.0

1 = very unfit, 3 = moderately fit, 5 = extremely fit

There were significant correlations between self-assessment of physical fitness and those who found the course physically demanding (Spearman's $r=.20$, $p<.001$). Women also gave a lower self-assessment of their physical fitness than the men ($p<.001$). There was no significant relationship between self-assessed fitness and any individual EHI data (including scores and incidents).

3.1.1.2 Pre and Post-Activity Questionnaires

(See Appendix Page 5)

3.1.1.2.1 Administration

Platoon staff administered the pre and post-activity questionnaires. Several platoons indicated that the Directing Staff read the completed questionnaires and in a few sections members stated that staff made negative remarks to individuals reporting symptoms on their questionnaires. Future work must ensure a better balance between total confidentiality (needed to encourage honest responses) and the need for staff to assess the effects of heat stress within their section or platoon.

The final questionnaire administered to all platoons asked members to rate the statement "I was able to honestly answer the other symptom questionnaires" using the scale "1" (no), "2" (mostly no), "3" (yes & no), "4" (mostly yes), "5" (definitely yes). Fifty-three individuals answered with either "1", "2", or "3", and on this basis, their pre and post-activity questionnaire data were excluded from the analysis.

One additional concern with the results was that many individuals reported answering the post-activity questionnaire with how they were feeling when the activity stopped. Many stated that they felt significantly worse during the activity but improved rapidly on stopping and having some rest (and sitting down to complete the questionnaire). Future work must ensure that members answer the post-activity questionnaires based on the symptoms they experienced during the activity.

3.1.1.2.2 Results

The pre and post-activity questionnaires asked members to self-assess how they felt either before the activity or during the activity based on 21 Exertional Heat Illness (EHI) symptom statements. Each statement (for example, "My coordination is/was off") would be answered as "0" (not at all), "1" (slight), "2" (somewhat), "3" (moderate), "4" (quite a bit), or "5" (extreme).

Composite EHI symptom scores for the 21 symptom statements are reported as percentages ranging from 0% (never experienced any of the 21 symptoms) to 100% (experienced all 21 symptoms in the extreme).

Table 4: Summary of Symptom Scores from Pre & Post-Activity Questionnaires

Course	Activity	n	Mean % ∓ SD	Range %	n > 2SD
Basic Officer	Pre 3K Forced March	233	12.6 % ∓ 10.4 %	0 – 51.4 %	14
	Post 3K	230	19.6 % ∓ 13.4 %	0 – 62.2 %	14
	Pre 5K Forced March	269	8.4 % ∓ 9.8 %	0 – 60.0 %	20
	Post 5K	268	14.6 % ∓ 12.8 %	0 – 72.4 %	13
	Pre 7K Forced March	278	5.2 % ∓ 6.2 %	0 – 35.2 %	16
	Post 7K	273	13.2 % ∓ 10.8 %	0 – 57.2 %	16
	Pre 13K Forced March	230	2.2 % ∓ 4.2 %	0 – 32.4 %	11
	Post 13K	228	10.2 % ∓ 8.6 %	0 – 50.4 %	14
	Pre Obstacle Course	266	10.8 % ∓ 9.8 %	0 – 48.6 %	8
	Post Obstacle Course	263	16.6 % ∓ 11.0 %	0 – 59.1 %	8
Level 2 Officer Different training program (Assessed EHI during 2 days of field taskings)	Day 1 - Questionnaire 1	48	21.0 % ∓ 20.2 %	0 – 82.8 %	4
	- Questionnaire 2	43	17.6 % ∓ 15.2 %	0 – 67.6 %	3
	- Questionnaire 3	45	17.4 % ∓ 15.0 %	0 – 67.7 %	3
	- Questionnaire 4	46	10.4 % ∓ 11.1 %	0 – 45.8 %	3
	- Questionnaire 5	44	11.2 % ∓ 11.8 %	0 – 44.8 %	3
	Day 2 - Questionnaire 1	31	8.1 % ∓ 8.8 %	0 – 35.2 %	2
	- Questionnaire 2	33	13.8 % ∓ 11.6 %	0 – 39.0 %	2
	- Questionnaire 3	42	14.8 % ∓ 10.8 %	0 – 42.8 %	1
	- Questionnaire 4	39	12.2 % ∓ 10.8 %	0 – 48.6 %	1
Basic Recruit #1	Pre 3K Forced March	140	1.6 % ∓ 3.8 %	0 – 32.4 %	5
	Post 3K	139	5.8 % ∓ 7.9 %	0 – 41.9 %	8
	Pre 5K Forced March	140	2.8 % ∓ 4.0 %	0 – 22.1 %	5
	Post 5K	136	9.8 % ∓ 9.0 %	0 – 52.4 %	4
	Pre 7K Forced March	121	1.6 % ∓ 3.2 %	0 – 20.0 %	0
	Post 7K	120	8.4 % ∓ 12.4 %	0 – 89.6 %	2
	Pre 13K Forced March	115	1.8 % ∓ 3.4 %	0 – 19.8 %	3
	Post 13K	115	7.0 % ∓ 8.2 %	0 – 39.8 %	5
	Pre Obstacle Course	46	2.9 % ∓ 4.0 %	0 – 14.2 %	4
	Post Obstacle Course	45	14.8 % ∓ 9.4 %	0 – 45.8 %	2
Basic Recruit #2*	Pre 3K Forced March	166	3.4 % ∓ 5.2 %	0 – 36.2 %	6
	Post 3K	166	4.4 % ∓ 6.4 %	0 – 43.8 %	8
	Pre 5K Forced March	154	3.2 % ∓ 5.6 %	0 – 45.8 %	11
	Post 5K	154	7.4 % ∓ 9.0 %	0 – 55.2 %	6
	Pre 7K Forced March	143	1.4 % ∓ 3.0 %	0 – 22.8 %	5
	Post 7K	142	5.0 % ∓ 7.2 %	0 – 44.8 %	6

Scores range from 0% (never experienced any of the 21 symptoms) to 100% (experienced all 21 symptoms in the extreme)

* Did not complete 13K questionnaires due to heavy rain and cool temperatures.

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For the Basic Officer and Basic Recruit groups, there were significant differences between the pre and post-activity questionnaires ($p < .001$). With the Level 2 Officer group (where four and five questionnaires were administered during two consecutive days of field taskings), the questionnaires administered at the hottest point of the day were significantly higher ($p<.001$) than the other sets of questionnaire data.

Individuals who reported a symptom score more than 2 SD above the mean on one questionnaire were no more likely to have another score more than 2 SD above the mean (even with pre and post questionnaires for the same activity) than others in their platoon. Also, there was no correlation between individuals whose symptom scores were above 2SD above the group mean (even on a platoon level) and the development of a heat related illness. This may be the result of the very limited reporting of incidents and/or individuals or staff taking effective action to reduce heat loads.

3.1.1.2.3 Prediction of EHI

As indicated in the literature, about 25% of those who experience Exertional Heat Illness (EHI) had prior symptoms that may have helped predict a potential problem. Of the 41 individual incidents of potential heat related problems, pre or post-activity questionnaire scores for 12 individuals, in retrospect, indicated that there was some reason for concern. The data showed that symptom questionnaires can identify increases in heat stress among platoon members and may also help identify some individuals at significant risk of EHI.

3.1.1.2.4 Short versus Long Questionnaires

Individual symptom statement responses were not recorded when the questionnaire data were entered into the database. Therefore, it was not possible to clearly determine if the nine symptom statement subset (used in the Clinic Questionnaires) could replace the 21 symptom statements used in the pre and post-activity questionnaires. However, of the 41 documented reports of potential heat related incidents, there were 12 individuals for whom the pre or post-activity questionnaires identified some prior symptoms. (This is consistent with the literature that indicates that about 25% of those who experience EHI have prior symptoms that may help predict a potential problem.) For these 12 individuals, their 21 symptom statement scores were compared with their scores from the nine symptom statement subset.

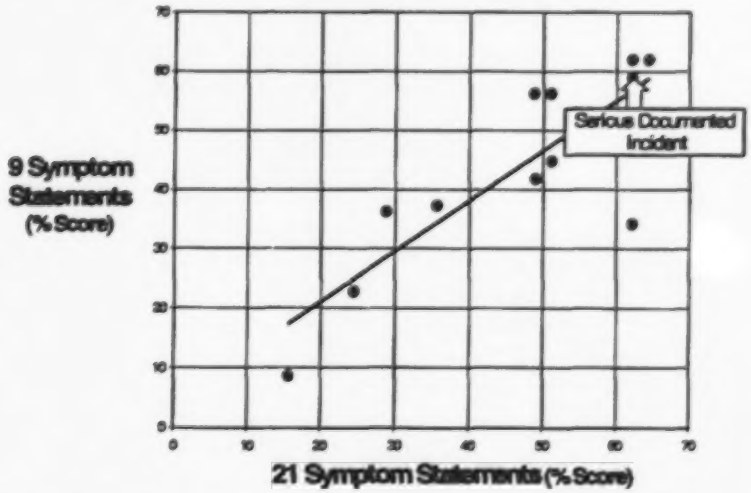

Figure 1: Exertional Heat Illness (EHI) Symptom Scores for 12 Reported EHI Incidents

For these 12 cases, there was a good correlation between the scores for the 9 symptom statements and the scores from the 21 symptom statements (Spearman's r=.84, p<.001). More data and analysis are required to determine if the nine symptom statements are sufficient to predict EHI incidents in the 25% of the population who have prior symptoms.

3.1.1.3 Final Questionnaire

(See Appendix Pages 6 – 8)

3.1.1.3.1 Body Mass Index (BMI)

BMI results from the final questionnaire are given in Table 1 (Section 3.1, page 10). Body Mass Index (BMI) was calculated from height and weight data with values between 20 and 25 considered acceptable. There were no significant correlations between BMI and either the self-reporting of symptoms on questionnaires, or recorded incidents of potential Exertional Heat Illness (EHI) problems. Over 25% of all individuals in the study had a BMI above 25. Height and weight need to be measured on arrival at St. Jean in order to determine if there are correlations between BMI and either EHI and/or performance during training.

3.1.1.3.2 Physical Fitness

Table 5: Self-Reported Assessments of Physical Fitness & Prior Physical Activity

Rating	Basic Officer	Level 2 Officer	Basic Recruit#1	Basic Recruit#2
Weekly Exercise prior to S.J.: Mean ∓ SD	3.6 ∓ 1.0	3.5 ∓ 1.5	3.6 ∓ 1.0	3.5 ∓ 1.1
Range	1 - 5	1 – 5	1 – 5	1 – 5
Initial Fitness Level: Mean ∓ SD	3.4 ∓ .7	3.3 ∓ .8	3.2 ∓ .9	3.2 ∓ .9
Range	1.0 – 5.0	1.0 – 4.6	1.0 – 5.0	1.0 – 5.0

Self-assessed: Weekly Exercise (15 minute aerobics)
1-less than once a week, 3-3 times per week, 5-7 times a week
Fitness on scale from: 1-very unfit, 3-moderately fit, 5-extremely fit (from Clinic Questionnaire)

Level of physical activity in the month prior to coming to St. Jean was defined using Health Canada's daily minimum of 15 minutes of vigorous activity. The latest Health Canada survey shows that in the 15 to 19 age group, 38% are inactive and within the 20 to 24 age group, 49% are inactive. The mean values for trainees in the study are therefore, typical of their peers, but there remains a significant risk of injury for unfit and inactive individuals arriving in St. Jean for training.

When the final questionnaire data from all groups are combined, those who rated the course as physically demanding were likely to report:

1) finding the course mentally demanding (Spearman's r=.40, p<.001),
2) a low level of physical activity in the prior month (Spearman's r=-.20, p<.001)
3) experiencing symptoms of Exertional Heat Illness (EHI) (Spearman's r=.24, p<.001), and
4) telling others about their EHI symptoms (Spearman's r=.13, p<.005)

Those who were extremely fit when they came to St. Jean felt their physical fitness level decreased during their course. These individuals were particularly frustrated when confined to barracks during the early part of the course as this limited their ability to complete even part of their daily fitness routine.

Given the difficulty in assessing the fitness level of the members at the beginning of the course, it is recommended that a fitness test be given to all members on their arrival at St. Jean. This will provide useful information to Directing Staff and also help determine if there is a link between low fitness and EHI.

3.1.1.3.3 Knowledge of EHI

Table 6: Trainee Knowledge of Exertional Heat Illness (EHI)
(% Answered Correctly)

Knowledge Area	n	Mean ∓ SD	Range	n > 2SD
Symptoms of EHI	649	85% ∓ 5%	10% - 100%	30
General Knowledge of EHI	649	74% ∓ 15%	31% - 100%	12
Susceptibility to EHI	649	58% ∓ 17%	0% - 100%	14
Prevention of EHI	648	94% ∓ 11%	33% - 100%	39

The final questionnaire and platoon briefings that followed, demonstrated that less than 5% of platoon members are totally clear about the signs and symptoms of Exertional Heat Illness (EHI). A significant number, while recognizing the EHI can be fatal, equated it with Heat Stroke in terms of both signs and treatment. Of particular concern was the fact that over 90% did not recognize that they were personally susceptible to EHI. Most felt that if they were physically fit and not extremely overweight, then they were unlikely to have a problem. Although almost all were very aware of basic ways to prevent EHI, over 16% were unaware that sprinkling water on the body can help with cooling. Although all platoon members received the Heat Stress Instructional pamphlet, over 10% of respondents were unaware of the value of acclimatizing to the heat by slowly increasing physical activity.

3.1.1.3.4 Reporting

The final questionnaire asked members (in the context of their training course in St. Jean) to rate the statement "I experienced symptoms of Exertional Heat Illness", using the scale "1" (no), "2" (mostly no), "3" (yes & no), "4" (mostly yes), "5" (definitely yes). In an open-ended question, they were also asked to describe their personal symptoms when they felt closest to EHI. The following table summarizes the results.

Table 7: Reporting of EHI Symptoms

Self-Reported Rating	Basic Officer	Level 2 Officer	Basic Recruit#1	Basic Recruit#2
Reported Having Some EHI Symptoms[+]	34%	52%	49%	56%
Described Having Some Symptoms[+]	63%	70%	89%	77%

[+] From the Final Questionnaire

The above table shows that although many individuals reported having no symptoms of Exertional Heat Illness (EHI), their answers to the open ended questions listed symptoms that were clearly linked to EHI. This confusion over symptoms and their potential relation to EHI limits the ability to recognize problems and take

appropriate action. This also contributed to significant under-reporting of potential EHI problems or incidents that may have been helpful in identifying high risk scenarios.

Between the post-activity and final questionnaires, there were over 40 instances (5% of the total population in the study) where members reported either numbness in parts of the body and/or visual disturbances (either blurring or tunnel vision). This is a concern in that it may indicate central nervous system involvement. In the followup briefings, members wanted clear information on how to distinguish numbness from carrying a load or poorly fitting equipment from numbness potentially related to EHI.

The final questionnaire asked members to rate the statement "I always let others know when I had symptoms of heat illness" using the scale "1" (no), "2" (mostly no), "3" (yes & no), "4" (mostly yes), "5" (definitely yes) in the context of their training in St. Jean. Although there were individual responses at both ends of the spectrum, the average response across all platoons was between "mostly no" and "yes & no" (i.e. - between 2 and 3). Members of Officer platoons reported being less likely to let others know than members of the Basic Recruit groups. Older members were more likely to let others know than younger individuals (Spearman's $r=.11$, $p<.05$).

Up to 30% of members in individual platoons reported in their final debriefing sessions that they did not let others know they were having symptoms of EHI as they did not want to be sent to the Clinic. The expectation was that a Clinic visit would result in missed training time and a potential failure in the course that would result in either having to take the entire course again or a release from the Forces.

There needs to be a reasonable alternative between not reporting symptoms and going to the Clinic for treatment. Staff at the Canadian Forces Leadership and Recruit School (CFLRS) must explore creative ways to ensure that symptoms are reported without resulting penalties for the individual. Options might include no-penalty reporting, peer identification and treatment, anonymous reporting, assessing symptoms within the platoon as a whole and taking action to reduce heat stress etc. This is obviously a very difficult task but is essential in order to prevent serious Exertional Heat Illness (EHI) cases among trainees. Full reporting of all incidents is also necessary to get sufficient research data to evaluate the validity of current Canadian Forces procedures and standards for effective prevention of EHI.

3.1.1.3.5 EHI Training

The majority (variations among platoons ranged from just over 50% to 100% of platoon members) thought that there should be a detailed practical training session on Exertional Heat Illness (EHI) within a few days of arriving in St. Jean. Although they all received the Heat Stress Instructional Pamphlet, most had not read it and did not understand the procedures that are supposed to be in place to prevent EHI during training. Members wanted to better understand signs, symptoms, and susceptibility, but also asked for specific information on how to make better personal choices to decrease risk of EHI. This initial training must be consistently reinforced throughout the entire training period.

Comments from both the final questionnaires and briefings indicated that members want to know practical ways they can decrease their risk of developing EHI and successfully complete their courses. Many were unaware that small choices they make during training can add up to increase their susceptibility to EHI. It is obviously more difficult for younger members to absorb this knowledge than it is for those with more life experience. Training must stress that a serious EHI can not just jeopardize the mission and potentially put others at risk, but can also be both career limiting (e.g. – loss of consciousness for pilots) and/or life threatening. The curriculum must be examined to identify all opportunities to integrate and reinforce these lessons outside of the classroom.

Given the frequency of reported symptoms of numbness in parts of the body, there must be improved training on the proper use of combat clothing and equipment, including load carriage. This will help individuals differentiate between numbness from load carriage and numbness as a potential EHI symptom.

Although we do not have the full details of the current training provided on EHI, the main focus seems to be on classical heat illness (heat stroke) with limited discussion of issues related specifically to exertional heat illness. It is critical that all members realize that they are personally at significant risk of EHI during summer training in St. Jean. It is strongly suggested that the training curriculum and printed materials be reviewed and updated to ensure that are highly practical and also reflect the latest research on EHI.

Over the summer, the school developed posters to increase awareness among both staff and trainees. One staff member suggested a wallet card with symptoms and treatment that could be carried during training. These are all positive steps that will build awareness and aid in prevention. School, Medical and Physical Training staff must be fully briefed early in the season (with refresher sessions as new personnel arrive) on EHI, the symptoms, the risks, prevention and treatment. The fairly consistent concerns platoon members raised about Physical Training sessions indicate that some Physical Training staff may be unaware of EHI, the significant risks, and the need to take action to prevent serious EHI.

3.1.1.3.6 Smoking

The incidence of smoking in the study population increased during training at St. Jean. In one platoon the percentage of recruits smoking increased from 14% prior to coming to St. Jean, to 25% during training. As this is the first time many young people are involved with the Canadian Forces, it may convey the unfortunate message that although smoking may not be actively condoned, neither is it discouraged.

This is a significant concern with health, performance, and cost implications throughout the member's service with the Canadian Forces.

3.1.1.3.7 Scheduling

For platoons that had two or more Physical Training periods combined with two or more periods of drill during a particularly hot day, over 20% of these platoon members reported being close to Exertional Heat Illness (EHI). Most felt that days with this schedule should be modified especially when it is extremely hot and humid. Often these sessions were scheduled around noon hour when temperatures were near their peak and the sun was extremely hot.

Eight platoons specifically mentioned that at least half of their physical training was done indoors. Although staff indicated at the beginning of the summer that training was always done outdoors when possible, some platoons reported very different circumstances, including one that spent about 75% of their time indoors. Many also reported not having time to apply sunscreen when going outside for Physical Training.

All Basic Recruit platoons raised concerns raised about the heat and lack of air movement in the gym where many did more than 50% of their physical training. In addition, the heat and lack of air movement in H104 was specifically linked to a couple of incidents during drill in July.

The Basic Recruit courses felt strongly that the training on Exertional Heat Illness (EHI) should be scheduled at the beginning of the course, rather than in week six of their 10 week course.

3.1.1.3.8 Hydration

All platoon members indicated that staff encouraged them to drink. In the final debriefing sessions, over 25% of all platoon members felt that the one litre canteen was too small for both larger individuals (who drink more), and when there are limited opportunities to replenish. CFB Borden issued a two litre canteen to school trainees and reported that the larger size works well.

When platoons were moving between classes on the base in St. Jean, many reported not having an opportunity to fill their canteens in the time available (e.g. – when moving between HD4 and L116). This must be addressed by providing more access points to refill canteens, allowing refills during classes, or providing more time.

At least a quarter of the individuals reported consciously limiting their fluid intake as there was often not an opportunity to pass urine. Some reported a lack of time to use the washrooms, while others thought it was an inadequate number of washrooms at a given location. Others reporting finding it very difficult to judge how to best ration their water over time.

Members were unaware that they should be using the washroom at least a couple of times during the day if they are drinking adequate quantities of water. Most did not realize that pale yellow colour urine was a sign of adequate hydration.

Almost all platoons reported concerns about drinking during Physical Training. Physical Training staff often restricted access to water during training periods. Staff training should help resolve this issue. CFB Borden issues a strap to allow individuals to carry their canteens during physical training sessions.

Some individuals asked for more juice crystals or juice as they found the water difficult to drink. A significant number asked about having access to Gatorade or other electrolyte replacements, especially as many were used to using them during their physical fitness training. Several mentioned the need for more juice in the Individual Meal Portions (IMPs) used in the field. When in quarters, it was suggested that bigger glasses would encourage more drinking.

One individual reported going to the Clinic or Hospital for treatment of a heat illness and having to drink six litres of water. This was the only indication of a concern for hyperhydration documented during the study. Training needs to identify over consumption of fluids as a potential concern.

3.1.1.3.9 Diet

Many members stated their concerns about the greasiness of the food available. This is a significant change in diet for many, and several vegetarians reported problems getting enough to eat in the field. As an example, in the all ranks mess, all the meal choices were very high in fat. Although clientele may demand poutine as a regular dish, there needs to be a concerted effort to reinforce more healthy meal choices.

Following the EHI incident where the individual was hospitalized, a concern was raised with situations where for example, the section task must find their rations in the bush. If the group does not find their rations, then there is a risk of some individuals continuing without adequate food intake, thereby increasing their risk of EHI. It is strongly suggested that the task of finding rations be removed from the training schedule and replaced with finding something else critical to the mission but not to the recruit's health.

3.1.1.3.10 Clothing and Equipment

Most platoons were not allowed to wear head covering when outdoors for Physical Training, despite this activity often being scheduled around noon. Midway through August, following a formal complaint after five individuals in one platoon developing "heat stroke", procedures were changed to allow individuals to wear their own baseball caps (not issued) when outside for Physical Training. Hats should be issued which provide adequate coverage for the head and neck and all staff must insist they be worn for outdoor activities.

There were several instances of bush caps either not being issued at the beginning of the course and/or being too small. Standard issue was the old bush caps and many found them hotter then either the beret or helmet. As mentioned above, it is essential that adequate head covering is worn during all outdoor training.

Most platoons reported wearing both tee shirts and combat shirts with the long sleeves fully buttoned when in the bush. Boot bands were worn by all platoons at all times, and only the top button of the shirt was open. When it was very hot some sections reported wearing gloves for long periods, leaving the face as the only exposed skin. One group reported wearing rain gear for over an hour on a very hot day to simulate chemical defence situations and this resulted in significant (yet formally undocumented) symptoms.

Despite Standard Operating Procedures (SOPs) directives, many platoons wore their helmets during forced marches, even when the WBGT exceeded standards. This was the case for the one severe heat illness incident documented. There must be a clear understanding of the need to expose skin to allow cooling. When it is hot and there are high physical demands, Directing Staff must ensure that helmets are removed for short periods of time, buttons undone, sleeves rolled up, etc.

As many individuals reported significant numbness in the extremities, it is important that members know how to adjust webbing and loads to ensure that blood flow is not restricted.

3.1.1.3.11 Practices

Sunscreen must issued on arrival and members given time to put sunscreen on. One platoon did not receive sunscreen until the second week.

Several sections reported that they were not allowed to pour water over their heads as the Directing Staff needed to know how much they were perspiring by looking at their clothing. This is a concern as this is a very useful way to reduce body temperature.

Some members reported problems after standing in the full sun for lectures. It is critical that these activities be assessed for their heat stress as well as more physically demanding activities.

3.1.1.4 Staff Questionnaires

Forty-eight staff from the Recruit Division and twenty staff from the Leadership Division completed an anonymous and confidential questionnaire on Exertional Heat Illness (EHI). Not all of these individuals were actively involved in training for the platoons involved in the study.

3.1.1.4.1 Knowledge of EHI

Table 8: Staff Knowledge of Exertional Heat Illness (EHI)
(% Answered Correctly)

Knowledge Area	n	Mean ∓ SD	Range	n > 2SD
Symptoms of EHI	68	78% ∓ 16%	30% - 100%	3
General Knowledge of EHI	68	76% ∓ 15%	23% - 100%	4
Susceptibility to EHI	68	59% ∓ 19%	0% - 85%	1
Prevention of EHI	68	93% ∓ 11%	50% - 100%	5

Knowledge of Exertional Heat Illness (EHI) among staff members was very similar to that of the platoon members surveyed. Some staff members had limited knowledge about Exertional Heat Illness (EHI) and the implications for training. Over 50% felt strongly that a lack of physical fitness, hydration, and personal choices (e.g. – alcohol consumption on weekends) are to blame for EHI cases. Their impressions were not supported by the data. There is limited awareness that highly physically fit and motivated military recruits are at very significant risk of EHI during training. Some staff did not know that not only can EHI be fatal, but also that it can cause irreversible damage even if the individual survives. Twelve percent of staff were not aware of the value of slowly increasing the amount of physical activity as you can acclimatize to the heat. Eighteen percent did not recognize the value of sprinkling water on the body to help cool down. Directing staff must be fully aware of all prevention and treatment options and have the authority to take appropriate action.

3.1.1.4.2 WBGT

Only five staff correctly recalled the essence of what the WBGT (Wet Bulb Globe Temperature) measured and what the index was used for. Although all were aware that there were procedures in place to prevent EHI, many were very vague about the specifics. Most were confused about the relationship between humidex, WBGT, and temperature and where these various readings were taken. The majority of staff were uncertain about how this information was transmitted through the chain of command, especially in Farnham.

Staff identified the concern that they often do not have access to the necessary WBGT information to help them adjust the schedule. Several activities continued when retrospective data indicated that there should have either been significantly modified or stopped and rescheduled. Staff need immediate access to this critical information whether in the classroom, doing Physical Training on the far side of the base in St. Jean, or doing field training in Farnham. This issue must be addressed.

3.1.1.4.3 EHI Training and Procedures

The data suggest the need for more systematic training of staff prior to the start of the summer courses (ideally in late April or early May). It is critical that Directing Staff in the field have full support up the line of command for following Standard Operating Procedures (SOPs) and taking action to prevent Exertional Heat Illness (EHI). Staff responsibility and limitations for adapting activities to the hot conditions must be clearly understood. During the summer, it is suggested that there be mandatory monthly refresher sessions for Directing Staff.

All SOPs, schedules, curriculum, and printed materials should be reviewed and updated annually to make further small changes to reduce the risk of EHI. Curriculum and printed materials should emphasize practical ways to educate platoon members about the effects of EHI and effective prevention. It is essential that all Directing Staff (including Physical Training staff) have a consistent understanding of EHI, standards and procedures, and effective ways to reduce risk of EHI.

The majority of staff do not clearly understand the issues and their personal responsibility in prevention of EHI among trainees. Some suggested the need for clear consequences for those who do not follow procedures and use good judgement to prevent EHI. Staff must better understand the role of WBGT readings in prevention. All staff must better understand signs, symptoms, and susceptibility and have access to practical information that helps both them and platoon members make better personal choices to help prevent EHI.

Thirteen percent of staff expressed significant concerns about prevention of EHI further eroding training standards that are already compromised by the poor quality of recruits. For this reason it is essential that training for both staff and platoon members provide practical ways to prevent EHI while maintaining or raising the standard.

Given the practice where Directing Staff may arrive at St. Jean only a couple of weeks prior to taking training course responsibilities, it is imperative that new training staff be teamed with an experienced staff member prior to taking sole responsibility for recruits.

As five percent of platoon members reported symptoms of numbness in parts of the body, (that can be a symptom of EHI) it is important that staff be trained in the correct use of combat clothing and equipment (including load carriage), so they can reinforce this with platoon members.

3.1.1.4.4 Physical Fitness and Body Mass Index

Over 75% felt that the low level of physical fitness and high Body Mass Index (BMI) of many trainees severely limited the value of the training courses. Many staff were frustrated with the low entry standards being used by recruiting centres. The fitness test results from the recruiting centres were only available for a small number of individuals and some test results were over a year old. The physical fitness test required for Canadian Forces Leadership and Recruit School (CFLRS) courses was completed partway through the training and gave only a pass/fail score, rather than an individual grade. Therefore, there is no valid way for staff to accurately assess physical fitness of the candidates when they arrive. Directing Staff are forced to "guess" at the fitness status of individuals and often were equating lack of fitness with excessive body weight (and higher fitness with lower body weights). Although members provided a reasonable self-assessment of their fitness levels on the Clinic and final questionnaires, their responses might be less accurate if this information was to be used directly by platoon staff.

There may be value in conducting a basic aerobic fitness test and taking height and weight measurements on entry in order to give Directing Staff a better idea of individuals who may require closer monitoring or remedial activity. This data, along with more complete reporting of EHI incidents might provide the information required to validate standards and procedures and help identify high-risk scenarios.

3.1.1.4.5 Reporting

Data from the questionnaires showed that staff expected that some individuals in their platoons would feel that the pre and post-activity questionnaire data were being used for purposes other than research. This provides further support for finding better ways to meet the need for both accurate research information and useful feedback for the Directing Staff. The majority felt that EHI was a real issue in the military, although some totally disagreed with that statement.

Among the staff, 70% were personally aware of at least one severe Exertional Heat Illness (EHI) incident. Some were aware of up to 90 instances. Although many indicated a significant number of minor EHI incidents in their platoons that were part of the study, the incident reporting does not provide details of these incidents. There should be further investigation to determine how to get complete documentation for all incidents. Some indicated that they were unclear about the criteria for reporting.

Eighty-four percent felt that it was difficult to identify mild or moderate symptoms of heat stress in trainees. Fifty-two percent of the staff had personally experienced some symptoms of EHI and over 70% indicated that they had not let others know they had EHI symptoms.

3.1.1.4.6 Staff Fitness and Smoking

The mean reported weekly fitness activity of staff was less than three times per week. Forty percent of those completing the staff questionnaires were smokers. Both issues cause concern, as Directing Staff are clear role models, especially for the younger trainees. Despite the demands of the training schedule, staff should be given time for physical training at least three times a week. CFLRS should vigorously support all those who are trying to stop smoking.

3.1.1.4.7 Schedules

Given the recommendations for heat acclimatization given in the Heat Stress Instruction Pamphlet, there is value in reassessing the schedule to ensure that these guidelines are being followed and that members from cool, dry climates have an opportunity to acclimatize. A quarter of the staff suggested some schedule changes, including moving the more physically demanding activities to the cooler morning hours, and increasing the length of the class periods to reduce the time spent in transit.

3.2 EHI Incidents and Medical Data

There were 41 incidents documented between 6 July and 3 September 1999 that were potentially related to Exertional Heat Illness (EHI). Platoon staff completed twenty-two incident forms between 9 July and 30 July. The Medical Assistant at the Clinic documented 19 incidents between 6 July and 3 September. For two incidents, both platoon staff and the Medical Assistant documented the incident. Three individuals had a potential EHI problem on two separate occasions. During the two Basic Recruit Training courses (19 July to 1 October) the platoons reported no incidents and only two cases were documented at the Clinic.

Two individuals were taken to hospital with hypothermia in September. One course instructor had a problem that was potentially heat related during training in June. These events were not included in the study statistics.

Only two individuals were documented by both platoon staff and staff in the Clinic. There were at least three cases where individuals were sent to the civilian hospital with EHI symptoms, yet there was no incident report or record in the daily log of clinic visits.

Data collected from interviews at the clinic were of limited value. The Medical Assistants did not feel comfortable with using the computerized form designed to collect data directly on the laptop computer, so instead, completed paper copies of the form. The format of the interview form should be revised to more closely reflect both the training program and critical factors.

In retrospect, even the Medical Assistants working on the project did not have a full understanding of the full range of issues that might contribute to EHI. Improving training would allow for better quality data to be collected.

For 12 of the 41 incidents, the individual had previously completed a questionnaire that gave some indication that there was a problem, with a symptom score that was more than 2 SD above the mean for the platoon. This is consistent with reports in the literature that indicate that approximately 25% of all individuals who experience EHI experience symptoms prior to collapse.

There was no correlation between scheduled immunizations and potential EHI incidents. The incidents are shown in the Appendix (pages 15-17) in relation to environmental conditions.

3.2.1 Serious Documented Incident

There was a serious incident with an 18-year-old male, Level 2 Officer trainee, ("OA") during exercises in the field (Farnham). On a Tuesday in early August at approximately 1600 hrs, "OA" suddenly went into convulsions that lasted for about ten minutes and then passed out. He was transported by ambulance to the civilian hospital in St. Jean and kept for two days of testing and observation. The Clinic cleared "OA" for return to full duty when his platoon came back from Farnham, late in the day on Friday of the same week.

The maximum WBGT reading in Farnham Tuesday was 27°C measured at 15:30 hrs. The reading taken at noon that day (Tuesday) was 21°C. Maximum WBGT readings in Farnham for the prior two days were and 27°C (Sunday) and 23.9°C (Monday).

A week after the incident, the contractor interviewed both "OA" and one of the Directing Staff for his platoon.

On the weekend off, "OA" had nine beers on Friday night and only one beer on Saturday night, as he knew they were returning to the field. Sunday he felt rested and notice was given at 9 p.m. Sunday of a 10 p.m. departure for Farnham. "OA" had little sleep Sunday night as he was somewhat stressed about a test at 6 a.m. on Monday morning. This was an activity he had failed when on course in May and had been given the opportunity to repeat the course. On Monday morning, "OA" again failed the activity. He knew that there would be one more

opportunity on Thursday of that week to complete the task and if he failed again he would be out of the Officer Program.

They covered between 10 and 30 km wearing helmets on Monday. The Directing Staff had mentioned to the Company Commander his concerns about platoon members wearing helmets during these taskings. Confirmation came on Monday morning that the wearing of helmets was no longer at the discretion of staff and that helmets would be worn if the WBGT was less than or equal to 25.9 °C. One of their section taskings was to find their rations. "OA"s section did not find their rations and at about 0030 hrs they turned in. "OA" got about four hours of sleep on Monday night.

At 0500 hrs "OA" felt hungry and tired. He had 1 IMP of hot chocolate and bread and raspberry jam and saved the rest, as his section had no rations. Among others in his section, one finished all their rations at 0500 hrs, another finished all their rations at noon, twelve ate all their rations between 0500 and 1200 hrs and four didn't eat at all. In the morning they marched 14K with helmets, weapon, webbing, sleeves rolled down and buttoned, and boot bands. "OA" was focussed on helping others pass and wore gloves and carried an ammo box with another male for at least 9K. He was very conscious of the handles digging in and also drinking lots of water.

The member did not remember sitting down to fill out a symptom questionnaire just before noon. This questionnaire (in retrospect), indicated that he had a serious problem as he had a score of 2.95 with numbness, cramps, irritability, dizziness, and some blurring of vision. Although the individual does not remember this, the Directing Staff saw the member eat something. "OA"'s last memory was carrying the ammo box and then collapsing. The next thing he remembers is waking up in hospital. Testing included a CATScan and assessment by a neurologist.

On release from hospital late Thursday afternoon he returned to barracks. On Friday he went to the Clinic and was cleared to return to full duty when his unit returned from the field later in the day. This visit was not recorded in the Clinic visit log and there was no CF 98 (Report on Injuries or Immediate Death Therefrom) completed for this incident. A report from the civilian hospital was included in "OA's" personal medical file.

"OA" is 18 years old and came to St. Jean from military college in an area with a similar climate. He is very keen on a career in the Infantry. His self-assessed fitness on the first Clinic Questionnaire was above moderately fit and he felt he was at his optimal body weight (BMI=21). He reported doing a minimum of 15 minutes of vigorous aerobic activity exercise at least three times a week in the month prior to coming to St. Jean. His early morning symptom score was the average for his platoon.

When asked about prior incidents, "OA" recalled an incident two years prior in the winter in St. Jean. He was playing basketball in a very hot gym for about two hours and left the gym to return to his room. Suddenly his eyes went totally black and he couldn't see at all. He used his hands to find the wall and moved along to sit down. He sat for about one hour before his vision returned to normal. As he felt fine afterwards, he did not seek medical follow-up.

In the week following the incident he did not have any further symptoms or heat problems.

Given research data that indicates that a prior EHI illness can increase risk of future incidents, there is a concern if in this case "OA" goes on to pursue a career in the Infantry.

3.3 Environmental Conditions

(See Appendix Pages 14 to 18)

Graphs of the maximum daily WBGT (and reported EHI incidents), maximum daily Humidex, and maximum daily temperature and humidity are given in the Appendix Pages 14 to 18.

Wet Bulb Globe Temperature (WBGT) data were not consistently collected. Data collection began in St. Jean on June 1st and continued until September 3rd. Readings were not taken on weekends. In Farnham (where the field exercises are held), they started data collection on June 1st and finished on August 12th.

Table 9: WBGT and Humidex Summary

	May Days		June Days		July Days		August Days		September Days	
	St Jean	Farnham	St Jean	Farnham	St Jean	Farnham	St. Jean	Farnham	St Jean	Farnham
WBGT recorded			20	16	22	28	21	11	1	
WBGT > 26 °C			5	8	9	25	8	4	1	
WBGT > 28.5 °C			1	1	2	9		1		
WBGT > 31.1 °C						1				
Humidex > 30 °C	3		16		23		10		10	

During the 95 day period when data were collected from the platoons (27 June to 1 October 1999), there were 64 days when WBGT readings were taken in St. Jean. Over this same period, there were 55 days when readings were taken in Farnham where platoons do their field training. Although the WBGT is supposed to be measured at regular intervals throughout the day, data were not always collected throughout the day, even when early readings indicated potential concern. This was due, in part, to limited staffing in St. Jean. Also, WBGT readings were not taken in Farnham after the middle of August, despite platoons being active until the end of September.

A significant concern is how the WBGT is communicated to Directing Staff involved in activities either in St. Jean or in Farnham. Although staff with access to computers can easily get the latest readings, it is more difficult to get this information when outdoors around the base or in the bush in Farnham. Common practice is to check the WBGT reading prior to beginning a forced march or field tasking, but there is some question about how staff are made aware of increases in WBGT readings as the day progresses. In retrospect, there were several times when activities went ahead as scheduled despite WBGT readings indicating the contrary.

Maximum WBGT readings in Farnham are typically between 0°C and 8°C above the WBGT recorded in St. Jean (Pearson's $r=.85$, $p<.001$). There is a significant correlation between the maximum daily Humidex and both the maximum WBGT reading in St. Jean (Pearon's $r=.86$, $p<.001$) and the maximum WBGT reading in Farnham (Pearson's $r=.79$, $p<.001$).

There was no consistent correlation between symptom questionnaires and either the maximum daily WBGT, the average daily WBGT reading, or the average WBGT on the previous day or average if the prior three days. This is probably due to the combination of incomplete WBGT data and the interaction with other factors such as scheduled activities and personal differences.

WBGT readings taken during August in the gym did not register any readings above 26°C. Given the continuing complaints, there needs to be further investigation into air circulation, air quality, and temperature both in the gym and in H104 to see if the environment can be improved.

An automated WBGT monitoring system should be implemented that allows hourly readings in both Farnham and St. Jean. Given the Humidex values from May 1 to 1 October, it is critical that measures be taken from 1 May until the end of September. If this is not possible, then other measures must be taken to ensure that all Directing Staff and Physical Training staff have relevant information to help them assess environmental heat load and modify activities accordingly.

3.4 Personal Information

In the final questionnaire, women reported being significantly more likely ($p<.001$) to report having experienced symptoms of Exertional Heat Illness (EHI) than their male colleagues. Other significant gender differences were that women were also more likely to identify potential EHI symptoms to others ($p<.005$) and also find the course physically demanding ($p<.05$) than men.

Younger individuals were significantly more likely to find the course physically demanding (Spearman's $r=.20$, $p<.001$) and less likely to identify problems related to exertional heat illness to platoon staff (Spearman's $r=.11$, $p<.05$).

Within the Basic Officer group, data from the first Clinic Questionnaire showed that individuals from cool dry climates were significantly more likely to be experiencing EHI symptoms than individuals whose home unit was in a hot, humid Canadian climatic zone very similar to St. Jean ($p<.01$).

3.5 Accident/Injury Information

3.5.1 Clinic Visits

During the period from 27 June to 1 October 1999, there were 2,482 visits to the clinic documented by the Medical Assistants. Over 65% of all clinic visits were from individuals in St. Jean taking Basic Officer, Level 2 Officer, or Basic Recruit training.

This pilot project was limited to military personnel at CFB St. Jean. Despite this limited population, the pilot project showed that even with significant effort in searching paper files, significant amounts of data entry, and good cooperation from the various parties, it was almost impossible to get useful information on the scope of Exertional Heat Illness (EHI) or work-related injuries and illness.

For example, medical assistance administered in Farnham was recorded in electronic format but the Clinic in St. Jean did not seem to have data available in electronic form that could be easily used in the study. Despite significant searching of paper files and records, the data was far from complete. Although the Leadership Division provided most trainee background information in electronic format, the personal information for Recruit Division trainees had to be manipulated to make it transferable. Records from recruiting centres (when available) were only available in paper form. All of the completed CF reporting forms for accidents and injuries were only available in paper format, requiring further data entry for analysis.

Most of the data recorded for the clinic visits were incomplete. As most of the original information was handwritten, errors in either interpreting or entering the data into a computerized format were to be expected. It was difficult to identify trainees from the school who visited the clinic, as often the service number and unit were either not reported, were not completely legible, or errors were made when entering the information into the computer. Twelve percent of records identified that the clinic visit was a result of an exercise or sports-related injury. Seldom was it possible to determine if the visit was related to a work-related injury or illness, and lost time from work activities was recorded for only 14 individuals.

There appear to be some instances where Clinic visits were not recorded. Two trainees that indicated in their final questionnaires that they had gone to hospital for heat related problems were not documented anywhere in the Clinic visit log. This raises a concern about what medical documentation exists in individual medical files and the rigours of follow-ups. This is especially critical for pension issues for members who may have acquired limiting injuries or illnesses during duty.

It is clear that if there is to be progress in identifying the scope of Exertional Heat Illness (EHI) problems during basic training, the various databases (both electronic and paper) must be reviewed and coordinated into a centralized system. Where feasible, the existing system(s) should be linked. The resource must be both useful and usable for a wide range of users. The failure of many of the current paper forms and systems is to a large part a result of effective deployment of resources. When there is limited time, the effort is expended in activities that provide a useful return. The current paper medical files for example, provide no such incentive.

3.5.2 General Safety Accident Prevention Forms (CF 663s)

There were 21 General Safety Accident Prevention Forms (CF 663s) filled out for trainees from the Canadian Forces Leadership and Recruit School (CFLRS) during the period from 28 June to 30 September 1999. These were completed by one individual who took information from a simplified short form and completed the coding and details required for the 663s. Most related to strains and sprains during training. During the same time interval, there were 23 CF 663 (General Safety Accident Prevention Forms) filled out for other military personnel in St. Jean.

The final questionnaires showed that less than two percent of platoon members and 18% of staff knew what the CF 663 (General Safety Accident Prevention Forms) were and what they were used for. This is consistent with the widely used estimate that less than 25% of all work-related accidents to military members are recorded on the CF 663 form.

3.5.3 Report on Injuries or Immediate Death Therefrom (CF 98s)

From 28 June to 30 September, there were eight Reports on Injuries or Immediate Death Therefrom (CF 98s) completed. Individual medical staff had very different interpretations of the circumstances under which the CF 98 should be completed. Some felt strongly that the form was only to be used for injuries and not illness. There were great differences of opinion about who should initiate the form and within what time frame.

One issue of concern is that a CF 98 was not completed for the individual who spent 2 days in the civilian hospital following and Exertional Heat Illness (EHI) incident. As has been stressed in other forums, the form needs to be made both usable and useful and then all medical staff must be well trained in their use.

Data from the final questionnaires administered to all platoons show that two percent knew what a CF 98 (Report on Injuries or Immediate Death Therefrom) was and what it was used for. Data from the questionnaires administered to staff from the Canadian Forces Leadership and Recruit School (CFLRS) indicate that 15% knew what a CF 98 (Report on Injuries or Immediate Death Therefrom) was and what it was used for. It is evident that there also needs to be an effort to raise the general awareness of all CF members about the need to document all work-related illness and injury.

3.5.4 Summary

Limited numbers and data quality (e.g. – records of clinic visits often did not include units or service numbers) made it impossible to correlate many of the variables of interest. As suspected, there appears to be a fairly inconsistent reporting system for accidents and injuries. Over the short period of the study, neither the CF 663s or CF 98s produced useful data to indicate trends or guide prevention efforts.

3.6 Limitations

Several factors combined to limit the outcomes of the study. Time restrictions did not allow piloting of the questionnaires or data collection methods. Data collection did not begin until the end of June. There was a Medical Assistant from the Clinic assigned to work full-time on the project, but this individual changed three times during the period of data collection. The Preventive Medicine Technician was not in St. Jean for most of the summer because of urgent overseas assignments and so the Medical Assistant spent a significant amount of time taking WBGT readings.

Electronic data were not available from the Clinic, so all data were obtained by hand searching of paper records and eventually entering the information into a computer database. The individuals working on the project were not sufficiently comfortable with using the laptop computer to do direct data entry, so much of the data was recorded on paper and then later entered into electronic format. Personnel limitations severely limited the time available for data entry, so individual symptom statements data were not separately entered.

Reporting of potential EHI problems was limited by the knowledge of both the individual platoon members, Directing Staff, Physical Training staff, and staff at the medical clinic. Data were not available from recruiting centre fitness tests and not all medical files were accessible with even basic height and weight data.

3.7 Further Study

Further investigation is necessary to clearly identify the factors that put individuals at risk. Although the quality of the data was good considering the limitations of time and personnel, there were very clear limitations as identified in Section 3.6. There is insufficient data to assess the validity of current Canadian Forces work/rest and hydration standards for physical exertion in the heat and current training procedures.

It is recommended that data be collected for the full five months, from 1 May to 30 September 2000. Information from Phase 1 can be used to refine the data collection instruments and methods in order to improve the quality and usefulness of the data. Increasing the size of the study population and improving the quality of data will provide better data to guide prevention initiatives.

Limitations of the data collected in 1999 show that it is critical that accurate WBGT data be consistently collected over the entire time period. It is also critical that height, weight, and physical fitness be measured when the members arrive in St. Jean for training.

As many individuals had some concern that the questionnaire data was not just being used for research purposes, better methods must be developed to address the confidentiality issue. Given the value of the questionnaires in identifying EHI, there must be consideration of how to use the data in a positive way that encourages members to be honest in their responses, yet optimizes the potential for prevention.

With regard to the significant time and effort required for data collection, another question is if the form can be shortened to substantially less than 25 statements. Further data collection is required to determine if a shorter subset of questions can be used. If there is some lead time prior to data collection another summer, then alternative formats, wording, and scanning options for data entry can be explored and properly tested for usability.

In conjunction with continuing the Exertional Heat Illness (EHI) study in 2000, it would be useful to pilot a new electronic database elements that will track EHI, and accident and injury information. Until this data is electronically integrated with other information, there is almost no potential to make the improvements in systems and equipment that can significantly impact the effectiveness and wellbeing of Canadian Forces personnel.

4. Recommendations

From the data collected in Phase 1, we are making specific recommendations for: the Canadian Forces Recruit and Training System (CFRETS) Headquarters, DCIEM, the Canadian Forces Leadership and Recruit School (CFLRS), Supply, and the Clinic at CFB St. Jean; and some general recommendations to further reduce the risk of future EHI incidents.

4.2 CFRETS Headquarters / DCIEM

4.2.1
Have all Directing Staff in place at least two weeks prior to the start of a course. Team new staff with an experienced staff member prior to taking full responsibility for recruits.

4.2.2
Institute an Exertional Heat Illness (EHI) training program and followup refresher training for all Physical Training staff and staff at the Medical Clinic who are involved with school trainees.

4.2.3
Consider requiring an aerobic fitness test and height and weight measurements during the first week of training. If these data are useful in predicting the risk of training injuries, course failures, and/or risk of Exertional Heat Illness (EHI), then there might be sufficient evidence to support either revising the recruiting standards and/or making entrance testing a permanent practice.

4.2.4
Ensure that data from the recruiting centre fitness tests are available for all trainees prior to their arrival. If the data show that there is a significant decrease in fitness between the recruiting centre test and testing at the beginning of training, then it may be necessary to look at measures to improve this situation.

4.2.5
Based on the results of Phase 1 of this study, revise the tools, techniques, and methodology to improve both the quality and quantity of data.

4.2.6
Using the improved study design, collect data on Exertional Heat Illness (EHI) for the entire period from 1 May until 30 September 2000.

4.2.7
In conjunction with further work to determine the scope of EHI problems during basic training, pilot an integrated computer database linking accident, injury, EHI, medical, and training data. Assess both the usability and usefulness of the system in helping assess operational readiness and guide prevention initiatives.

4.2.8
Initiate discussions about the value of using some of the tools from this research to investigate the incidence and effectiveness of prevention initiatives during active duty in hot climates.

4.2.9
Conduct a review of recruit physical training to identify and validate the goals of this segment of the program.

4.2.10
Review school policies for handling recruits that are unable to keep up with group activities. These individuals are an early warning signal that the rest of the group may also be at risk.

4.3 CFLRS

4.3.1
Implement changes to the Training Timetables:

a) Move the First Aid lecture on Exertional Heat Illness (EHI) to the first few days of the course for both Officer and Basic Recruit Courses. If possible, provide another period for further discussion of practical EHI prevention initiatives the following week.
b) Ensure a gradual increase in physical exertion in the heat consistent with the Acclimatization Schedule outlined in the CF Heat Stress Instructional pamphlet.
c) Eliminate all instances where there are two or more Physical Training periods combined with two or more periods of Drill in a day. (Currently these are often scheduled around the noon hour.)
d) Further limit physically demanding activities like Drill and Physical Training from the hottest hours of the day and indoor facilities with poor ventilation (e.g. the gym and H104).
e) Investigate options for allowing trainees to maintain fitness during time when they are confined to quarters.
f) If possible, lengthen the training periods to 1 hour.

4.3.2
Ensure that all staff attend at least three hours of systematic Exertional Heat Illness (EHI) training prior to the start of the summer courses (ideally in late April or early May). Schedule further training sessions during the summer to accommodate staff transferring in between May and September.

4.3.4
Provide monthly Exertional Heat Illness (EHI) refresher training for all staff.

4.3.5
Ensure that all Standards and Regulations related to Exertional Heat Illness (EHI) are current, workable, commonly understood by all staff and consistently reinforced and enforced.

4.3.6
Explore options for increasing access to washroom facilities in order to promote adequate hydration.

4.3.7
Ensure ready access to water during all Physical Training periods.

4.3.8
Reassess the adequacy of existing facilities and timetables for refilling canteens (especially between classes).

4.3.9
Replace the task of finding group rations from the field training schedule and substitute another task that is critical to the mission but not the member's health.

4.3.10
Ensure that adequate head and neck coverings and sunscreen are worn for outdoor activities.

4.3.11
Support individual staff in their initiatives to improve physical fitness and/or stop smoking.

4.4 St. Jean Clinic

4.4.1
Institute an automated WBGT monitoring system that allows hourly readings in both Farnham and St. Jean from 0900 to 1800 hrs, seven days a week from 1 May until 30 September. The resulting data must be easily accessible to Directing Staff in the field as well as to staff at the school.

4.4.2
Further investigate heat load and ventilation issues in both the gym and H104.

4.4.3
Provide specific training for all medical staff on Exertional Heat Illness.

4.4.4
Provide specific training for all medical staff on use of the "Report on Injuries or Immediate Death Therefrom) to increase use of the form when required.

4.4.5
Schedule further training sessions during the summer to accommodate staff transferring in between May and September.

4.4.6
Investigate ways to use electronic means to minimize unnecessary paperwork and improve the accuracy and usefulness of Clinic data.

4.4.7
Review the current MIR SOPs in regards to data collection and dissemination and ensure that adequate resources are being applied. If medical personnel are being tasked out, ensure the tasking agency knows the implications on the remaining personnel.

4.5 Supply

4.5.1
Ensure that all trainees are issued adequate head and neck covering and sunscreen within 24 hours of their arrival in St. Jean.

4.5.2
Issue two litre canteens and carrying straps to all trainees.

4.6 CFB St. Jean

4.6.1
Provide larger glasses and put pitchers of water on all the tables in the dining facilities to encourage drinking.

4.6.2
Explore ways to further increase the "healthy" content of food offered in the mess and field.

4.7 General EHI

4.7.1
Develop innovative methods to ensure full and detailed reporting of all potential Exertional Heat Illness (EHI) problems without negative repercussions for the individual experiencing symptoms.

4.7.2
Explore alternative treatment mechanisms for mild EHI symptoms that effectively reduce heat stress, provide good documentation, and eliminate concerns about potentially losing training time and being forced to cease training.

4.7.3
Enhance existing training with new content to help both staff and members make choices that reduce the risk of EHI and enhance performance.

a) Update existing EHI training materials for both staff and trainees.
b) Review and revise operating procedures to take into account the latest research on EHI and prevention.
c) Develop other innovative instructional materials specific to Exertional Heat Illness (EHI) (e.g. – posters, wallet cards, techniques for integrating practical EHI prevention skills into field training).

4.7.4
Further investigate options for access to fluid replacement alternatives such as additional juice, juice crystals or fluid replacement drinks.

4.7.5
Provide education in the proper use of combat clothing and equipment, including load carriage.

5. Conclusions

Phase 1 of this study had three significant outcomes.

1) Increased awareness about Exertional Heat Illness (EHI) among School trainees and staff at the School, Gym, and Clinic.

2) Preliminary data supporting initiatives to prevent Exertional Heat Illness (EHI) among military personnel.

3) Good information to use in improving the tools, techniques, methods, and training in order to increase both the quality and quantity of Exertional Heat Illness (EHI) data collected in future.

It is critical that this preliminary phase be extended in order to get sufficient data to assess the validity of current Canadian Forces standards and procedures. Data being collected by DCIEM will help provide a scientific basis for this assessment, but it is also critical to assess the standards under practical field conditions.

Following data collection during the summer of 2000, it would be logical to expand this work to facilitate the prevention of Exertional Heat Illness (EHI) among Canadian Forces personnel on active duty in other parts of the world.

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7. Appendices

Typical Basic Officer Course Timetable - 8 Weeks ..... *Appendix Page 1*

Basic Recruit Training Timetable ..... *Appendix Page 2*

Clinic Questionnaire #1 ..... *Appendix Page 3*

Clinic Questionnaire #2/#3 ..... *Appendix Page 4*

Pre and Post-Activity Questionnaire ..... *Appendix Page 5*

Final Questionnaire ..... *Appendix Page 6*

Staff Questionnaire ..... *Appendix Page 9*

Environmental Data – May 1999 ..... *Appendix Page 14*

Environmental and Incident Data – June 1999 ..... *Appendix Page 15*

Environental and Incident Data - July ..... *Appendix Page 16*

Environmental and Incident Data - August ..... *Appendix Page 17*

Environmental and Incident Data – September ..... *Appendix Page 17*

Typical Basic Officer Course Timetable - 8 Weeks

Week 1

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM				3PT			
				2DR			
					2DR		
PM							

Week 2

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM				2DR			
	3DR	2PT			2PT		
		C-1			2DR		
	3PT		3DR	2PT			
PM							

Week 3

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM	2DR		2PT				
	3K	2PT					
		2DR			2DR		
			2DR		2PT		
PM							

Week 4

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM		2PT		2DR			
		C-2			2PT		
			2PT	2PT			
			3DR		2DR		
PM							

Week 5

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM		2DR					
	2PT	2PT	5K		3DR		
	3DR		2DR	2PT	2PT		
PM							

Week 6

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM		2PT					
		2DR	2PT		HS		
	2PT				2PT		
	2DR				3DR		
PM							

Week 7

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM				3DR	DR		
		3PTT	3DR				
	3DR						
					7K		
PM							

Week 8

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM							
PM							

Week 9

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM					13K		
					Obs		
PM							

Week 10

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
AM							
		C-3	DR				
		F		DR			
	DR	DR					
PM							

Schedule Key (all periods are 40 minutes long)

- C1,C2,C3 = Clinic Immunization
- 2DR = 2 x 40 minute Drill periods (DR=1x40 3DR=3x40 min)
- Ex. = Field Exercises in
  - Debut
  - Bushcraft
  - Premier Pas
  - Dernier Pas
- HS = Heat Stress Lecture &
- 2PT = 2 x 40 minute Physical Training (3PT=3x40 min)
- PTT = Physical Training
- 3S = 3 x 40 minute Sports
- Lunch is 40 (indicated by double line across schedule)
- Dinner is scheduled for 65
- Scheduled
- Activity in

Data Collection

Clinic Questionnaires: *(administered by Medical Assistant)*

- *C-1 = Clinic 1 (1st*
- *C-2 = Clinic 2 (2nd*
- *C-3 = Clinic 3 (3rd*

Pre and Post-Activity Questionnaires:

(administered by Platoon Staff)

- *3K = 3K Forced*
- *5K = 5K Forced*
- *7K = 7K Forced*
- *13K = 13K Forced*
- *Obs = Obstacle*

Final Questionnaire: *(administered by Civilian Contractor)*

- *F = Final*

Basic Recruit Training Timetable

Week 1

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.				3PT			
				2DR			
					2DR		
P.M.							

Week 2

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.				2DR			
	3DR	2PT			2PT		
		C-1			2DR		
	3PT		3DR	2PT			
P.M.							

Week 3

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.	2DR		2PT				
	3K	2PT					
		2DR			2DR		
			2DR		2PT		
P.M.							

Week 4

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.		2PT		2DR			
		C-2			2PT		
			2PT	2PT			
			2DR		2DR		
P.M.							

Week 5

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.		2DR					
	2PT	2PT	*5K*		3DR		
	3DR		2DR	2PT	2PT		
P.M.							

Week 6

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.		2PT					
		2DR	2PT		HS		
	2PT				2PT		
	2DR				3DR		
P.M.							

Week 7

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.				3DR	DR		
		3PTT	3DR				
	3DR						
					7K		
P.M.							

Week 8

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.							
P.M.							

Week 9

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.					*13K*		
					Obs		
P.M.							

Week 10

Day	Mon	Tue	Wed	Thur	Fri	Sat	Sun
A.M.							
		C-3	DR				
		F		DR			
	DR	DR					
P.M.							

Schedule Key (all periods are 40 minutes long)

C1,C2,C3 = Clinic Immunization Sessions	
2DR = 2 x 40 minute Drill periods (DR=1x40 min / 3DR=3x40 min)	
Ex. = Field Exercises in Farnham:	
	Debut
	Bushcraft
	Premier Pas
	Dernier Pas
HS = Heat Stress Lecture & Video	
2PT = 2 x 40 minute Physical Training periods (3PT=3x40 min)	
PTT = Physical Training Test	
3S = 3 x 40 minute Sports periods	
Lunch is 40 minutes (indicated by double line across schedule)	
Dinner is scheduled for 65 minutes	
	Scheduled Activity
	Activity in Farnham

Data Collection

Clinic Questionnaires: *(administered by Medical Assistant)*

C-1 = Clinic 1 (1st Immunization)
C-2 = Clinic 2 (2nd Immunization)
C-3 = Clinic 3 (3rd Immunization)

Pre and Post-Activity Questionnaires:

(administered by Platoon Staff)

3K = 3K Forced March
5K = 5K Forced March
7K = 7K Forced March
13K = 13K Forced March
Obs = Obstacle Course

Final Questionnaire: *(administered by Civilian Contractor)*

F = Final Questionnaire

Clinic Questionnaire #1

The purpose of this research is to review the current Canadian Forces (CF) standards for physical exertion in the heat. The results will recommend either maintaining or improving the existing standards.

All information collected in this study will be kept confidential and used for research purposes only. NO personal information will go to any of your instructors or be included in any military files.

Thank you for your assistance.

Defence and Civil Institute of Environmental Medicine (DCIEM) Toronto, ON – June 1999

Protected A (when completed)

Surname / Given Names	SN

Place an X in the box that best corresponds to how you have been feeling since your arrival at CFLRS St. Jean.
Please answer every item. If you have not had the symptom, fill in "O" (not at all).
0 = Not at all **1** = Slight **2** = Somewhat **3** = Moderate **4** = Quite a bit **5** = Extreme

	0	1	2	3	4	5
I felt lightheaded						
I had a headache						
I felt dizzy						
I felt faint						
I lost my appetite						
I felt sick						
I was thirsty						
I felt tired (from exercise)						
I felt restless						
	0	1	2	3	4	5

Place an X on each of the lines below, showing how you would rate yourself on your arrival at CFLRS St. Jean:

Personal physical fitness level:

Very unfit — Moderately Fit — Extremely fit

Body weight compared to your ideal weight :

Underweight — Ideal — Slightly Overweight — Moderately Overweight — Extremely Overweight

Thank you for your assistance. *Clinic#1*

Clinic Questionnaire #2/#3

Protected A (when completed)

The purpose of this research is to review the current Canadian Forces (CF) standards for physical exertion in the heat. The results will recommend either maintaining or improving the existing standards.

All information collected in this study will be kept confidential and used for research purposes only. *NO personal information will go to any of your instructors or be included in any military files.*

Thank you for your assistance.

Defence and Civil Institute of Environmental Medicine (DCIEM) Toronto, ON – June 1999

Surname / Given Names	SN

Place a ✔ in the box that best corresponds to how you have been feeling over the last week.
Please answer every item. If you have not had the symptom, check "O" (not at all).

0 = Not at all **1** = Slight **2** = Somewhat **3** = Moderate **4** = Quite a bit **5** = Extreme

	0	1	2	3	4	5
I felt lightheaded						
I had a headache						
I felt dizzy						
I felt faint						
I lost my appetite						
I felt sick						
I was thirsty						
I felt tired (from exercise)						
I felt restless						
	0	1	2	3	4	5

Place an ✔ on the line below, showing how you would rate your current physical fitness level:

Very unfit — Moderately Fit — Extremely fit

Thank you for your assistance.

Clinic #2/#3

Pre and Post-Activity Questionnaire

Protected A (when completed)

The purpose of this research is to review the current Canadian Forces (CF) standards for physical exertion in the heat. The results will recommend either maintaining or improving the existing standards. All information collected in this study will be kept confidential and used for research purposes only. NO personal information will go to any of your instructors or be included in any military files.

Defence and Civil Institute of Environmental Medicine (DCIEM) Toronto, ON – June 1999

Platoon : _____ Activity : _____ Date : _____ Time : _____

Surname: _____ First Name: _____ SN:_____

Place a ✔ in the box that best corresponds to how you: Feel Now / Felt During this Activity
Please answer every item. If you have not had the symptom, check "0" (not at all).

0 = Not at all 1 = Slight 2 = Somewhat 3 = Moderate 4 = Quite a bit 5 = Extreme

Feel Now	0	1	2	3	4	5	Felt During Activity
I feel lightheaded							I felt lightheaded
I have a headache							I had a headache
I feel dizzy							I felt dizzy
I feel faint							I felt faint
My coordination is off							My coordination was off
I am short of breath							I was short of breath
It is hard to breathe							It was hard to breathe
My heart is beating fast							My heart was beating fast
I have a muscle cramp							I had a muscle cramp
I have stomach cramps							I had stomach cramps
I feel weak							I felt weak
I feel warm							I felt warm
I am sweating all over							I was sweating all over
Parts of my body feel numb							Parts of my body felt numb
My vision is blurry							My vision was blurry
I have lost my appetite							I lost my appetite
I feel sick							I felt sick
I am thirsty							I was thirsty
I feel tired (from exercise)							I felt tired (from exercise)
I feel irritable							I felt irritable
I feel restless							I felt restless
	0	1	2	3	4	5	

0 = Not at all 1 = Slight 2 = Somewhat 3 = Moderate 4 = Quite a bit 5 = Extreme

Thank you for your assistance.

Protected A (when completed)

Final Questionnaire

Protected B (when completed)

Surname: _____ First Name: _____ SN: _____

1. **Exertional heat illness involves the body overheating as a result of physical exertion. Please ✔ each of the following statements as either True or False:**

Symptoms of exertional heat illness may include:	**True**	**False**
Cool dry skin and total lack of sweat		
Dizziness, feeling faint, or lightheaded		
Headaches		
Stomach upset, nausea, stomach cramps		
Feeling thirsty, lack of appetite		
Sweating all over		
Lack of coordination		
Extreme fatigue from exercise		
Numbness in parts of the body, blurred vision		
Irritability, restlessness		
Exertional heat illness:	**True**	**False**
Can be fatal		
May occur very suddenly		
Must be treated quickly to prevent damage to the brain and internal organs		
Is unlikely to occur if you are physically fit		
Occurs most often in very old people or very young children		
Can be easily diagnosed by lack of sweat		
Can be prevented by drinking when thirsty		
Is the same as heat stroke		
Will only occur when the air temperature is above 20° C		
Can be prevented by keeping your head and skin covered		
Is easily diagnosed by thirst or lack of thirst		
Can occur in the winter		
Is more likely in those who drink too much water		
You may be more susceptible to exertional heat illness if:	**True**	**False**
You are not used to working in a warm environment		
You remove your helmet or head covering in hot weather		
You are physically fit		
You wear protective clothing when physically active in the winter		
You consume alcohol within the last 24 hours		
You use amphetamines, cocaine		
You are highly motivated to continue		

To prevent exertional heat illness you should:	True	False
Take action when there are early signs and symptoms		
Watch for potential signs and symptoms in others (that they might not recognize)		
Take regular and frequent rest breaks when it is extremely hot		
Slowly increase your physical activity as you get used to the heat		
Drink water regularly, even when not thirsty		
Sprinkle water on the body to help cool down		

2. **In the month prior to your arrival at St. Jean:**
   Did you do vigorous exercise (i.e. - at least 15 minutes of vigorous activity such as calisthenics, jogging or racquet sports, team sports, dance classes or brisk walking):

   _____ **Less than once weekly or never**

   _____ **Once or twice weekly** ____ **5 or more times weekly**

   _____ **3 or more times weekly** _____ **7 or more times weekly**

3. **With regard to your training here at St. Jean, place a ✔in the box that best corresponds to how you feel.** Please answer every item.

1 = No 2 = Mostly No 3 = Yes & No 4 = Mostly Yes 5 = Definitely Yes

	1	2	3	4	5
I was able to honestly answer the other symptom questionnaires					
I feel confident this information will not be used except for research					
Exertional heat illness is a real issue in the military					
I experienced symptoms of exertional heat illness					
I feel my symptoms were more related to stress than exertional heat illness					
I always let others know when I had symptoms of heat illness					
I found this course physically demanding					
I found this course mentally demanding					
I felt extreme pressure to perform					
I found it difficult to eat the food provided					
I feel I got enough sleep					
I was encouraged to drink water frequently					
At the end of this course, my body weight is where I think it should be					
My fitness level has improved during the course					
Drill was very physically demanding in terms of heat stress					
	1	2	3	4	5

4. **While in St. Jean, I have been smoking an average of _____ package(s) of cigarettes a day.**

   Prior to arriving at St. Jean, I smoked an average of _____ package(s) a day.

5. **While in St. Jean, I have been drinking an average of _____ caffeinated beverage(s) a day. (coffee, tea, cola-cola, pepsi etc.)**

   Prior to arriving in St. Jean, I was drinking an average of _____ caffeinated beverage(s) a day.

6. **Can you briefly describe the time when you felt you were closest to having an exertional heat illness during your training?(What were you doing, prior activities, any factors that you think might have made you more susceptible, what you did about it, what others around you did about it .. etc?)**

7. **What is a CF 663 and what is it used for?**

8. **What is a CF 98 and what is it used for?**

9. **Is there anything else we need to consider when looking at exertional heat illness issues? (Please write any further comments on the back of the page.)**

Thank you for your assistance.

Staff Questionnaire

Protected B (when completed)

We need your input on Exertional Heat Illness issues during basic training. Please answer these questions to the best of your ability. Your honest and open answers will help us ensure that we fully understand the practical issues and views of the Directing Staff. This information will be used for research purposes only and ONLY summary results will be reported. ***Thank you.***

1. Exertional heat illness involves the body overheating as a result of physical exertion.

Please ✔ each of the following statements as either True or False:

Symptoms of exertional heat illness may include:	**True**	**False**
Cool dry skin and total lack of sweat		
Dizziness, feeling faint, or lightheaded		
Headaches		
Stomach upset, nausea, stomach cramps		
Feeling thirsty, lack of appetite		
Sweating all over		
Lack of coordination		
Extreme fatigue from exercise		
Numbness in parts of the body, blurred vision		
Irritability, restlessness		
Exertional heat illness:	**True**	**False**
Can be fatal		
May occur very suddenly		
Must be treated quickly to prevent damage to the brain and internal organs		
Is unlikely to occur if you are physically fit		
Occurs most often in very old people or very young children		
Can be easily diagnosed by lack of sweat		
Can be prevented by drinking when thirsty		
Is the same as heat stroke		
Will only occur when the air temperature is above 20° C		
Can be prevented by keeping your head and skin covered		
Is easily diagnosed by thirst or lack of thirst		
Can occur in the winter		
Is more likely in those who drink too much water		
You may be more susceptible to exertional heat illness if:	**True**	**False**
You are not used to working in a warm environment		
You remove your helmet or head covering in hot weather		
You are physically fit		
You wear protective clothing when physically active in the winter		
You consume alcohol within the last 24 hours		
You use amphetamines, cocaine		
You are highly motivated to continue		

To prevent exertional heat illness you should:	True	False
Take action when there are early signs and symptoms		
Watch for potential signs and symptoms in others (that they might not recognize)		
Take regular and frequent rest breaks when it is extremely hot		
Slowly increase your physical activity as you get used to the heat		
Drink water regularly, even when not thirsty		
Sprinkle water on the body to help cool down		

2. **How often do you currently do vigorous exercise (i.e. - at least 15 minutes of vigorous activity such as callisthenics, jogging or racquet sports, team sports, dance classes or brisk walking):**

_____ **Less than once weekly or never**

_____ **Once or twice weekly** ____ **5 or more times weekly**

_____ **3 or more times weekly** _____ **7 or more times weekly**

3. **I currently smoke an average of _____ package(s) of cigarettes a day.**

4. **Place a ✔in the box that best corresponds to your opinion.** Please answer every item.
1 = No 2 = Mostly No 3 = Yes & No 4 = Mostly Yes 5 = Definitely Yes

	1	2	3	4	5
My platoon honestly answered the symptom questionnaires					
Members were confident this information would only used for research purposes					
Exertional heat illness is a real issue in the military					
I have personally experienced symptoms of exertional heat illness					
I feel my symptoms were more related to stress than exertional heat illness					
I have always let others know when I had symptoms of heat illness					
My platoon found this course physically demanding					
My platoon found this course mentally demanding					
My platoon felt extreme pressure to perform					
My platoon found it difficult to eat the food provided					
My platoon got enough sleep					
My platoon was encouraged to drink water frequently					
Platoon members always let staff know when they had symptoms of heat illness					
Platoon members improved their fitness level during the course					
It is difficult to identify mild or moderate symptoms of heat stress in trainees					
	1	2	3	4	5

5. **What is a CF 663 and what is it used for?**

6. **What is a CF 98 and what is it used for?**

7. **What is a WBGT reading and what is it used for?**

8. **What procedures are currently in place to prevent exertional heat illness in trainees at the school in St. Jean?**

9. **To your knowledge, how many instances were there this summer (1 May to 30 September 1999) when trainees from the school in St. Jean had extreme symptoms of Exertional Heat Illness?**
   (e.g. – convulsions, loss of consciousness)

   a) _____ **cases**

   b) **Please briefly describe details of events you were personally involved with (who, their symptoms, action(s) taken, prior activities, environmental factors etc. that may have contributed)**

10. In your military career, how many instances of extreme Exertional Heat Illness are you aware of? (e.g. – convulsions, loss of consciousness)

a) _____ **total number**

b) _____ **number occurring during basic training of military personnel**

c) _____ **number you have personally observed**

11. With trainees under your direction this summer (1 May to 30 September 1999):

a) **How many times did individuals experience minor symptoms of exertional heat illness which were relieved in a short period of time (e.g. – break in the shade, reducing the pace of activity, loosening clothing or removing head covering, drinking water) while the rest of the group continued activity?**
_____ **times**

b) **How many times were minor changes made to the activities of the group to prevent exertional heat illness (e.g. – changes in timing, move to the shade, intensity of the activity, gear worn etc.)?**

Timing of activities	_____ **times**
Location of activities	_____ **times**
Clothing or gear	_____ **times**
Frequency of breaks	_____ **times**
Intensity of activities	_____ **times**
Intake of Food or Water	_____ **times**

c) **How many times was basic first aid (not involving transfer to the MIR or hospital) given to an individual who may have been experiencing exertional heat illness during an activity.**
_____ **times**

d) **How many times were individuals experiencing symptoms that may have been related to exertional heat illness sent for followup at the MIR or hospital?**
_____ **times**

12. Based on your experience, what (if anything) should be done to prevent exertional heat illness during basic training?

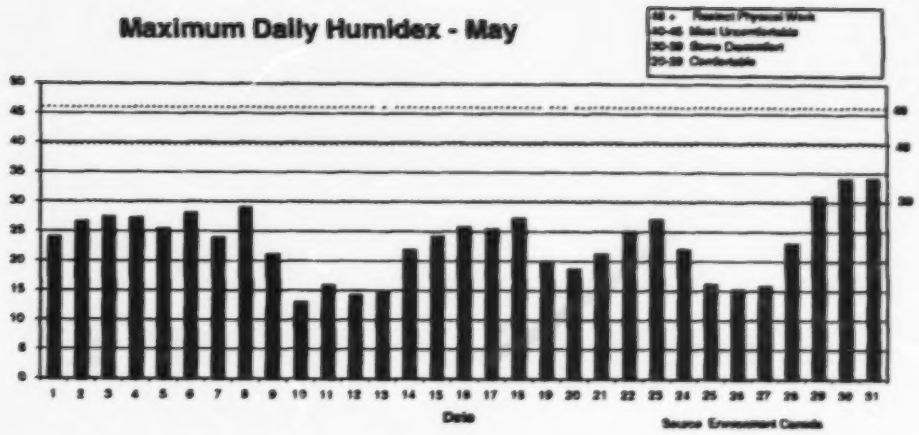
13. If this research is continued next summer, can you suggest specific changes that would make it more useful?

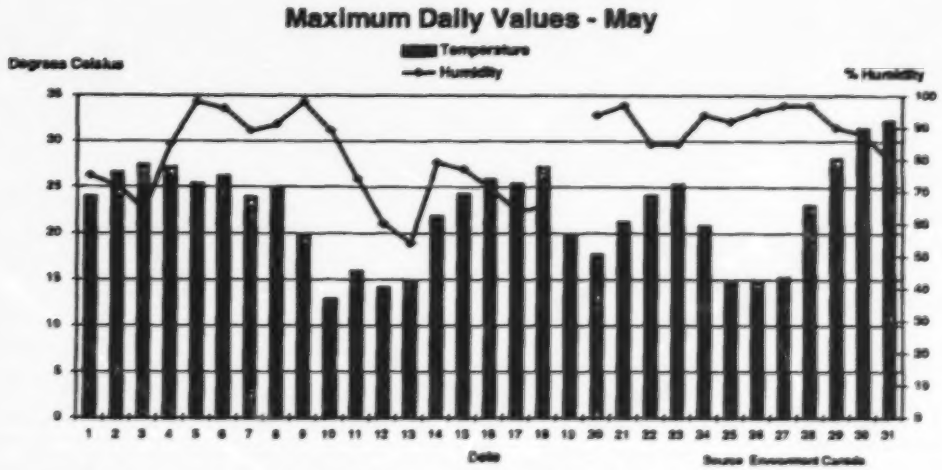
14. In your opinion, is there anything else we need to consider when looking at exertional heat illness issues? (Please write any further comments on the back of the page.)

Thank you for your assistance.

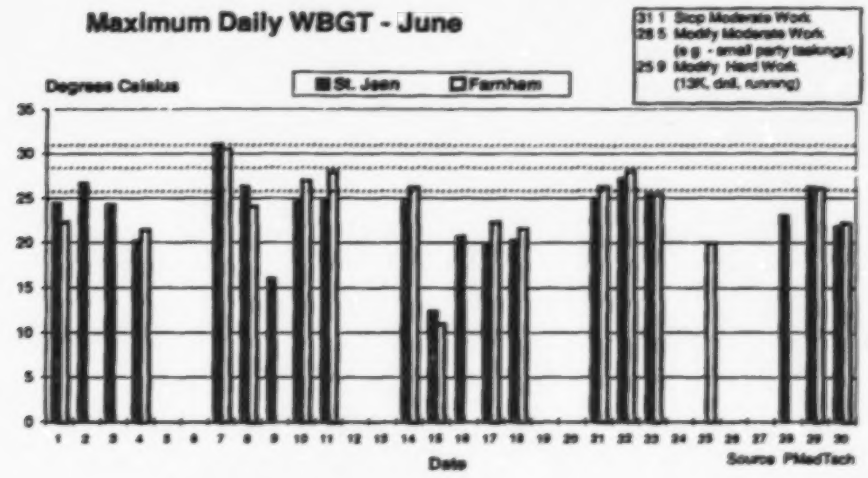
Environmental Data – May 1999

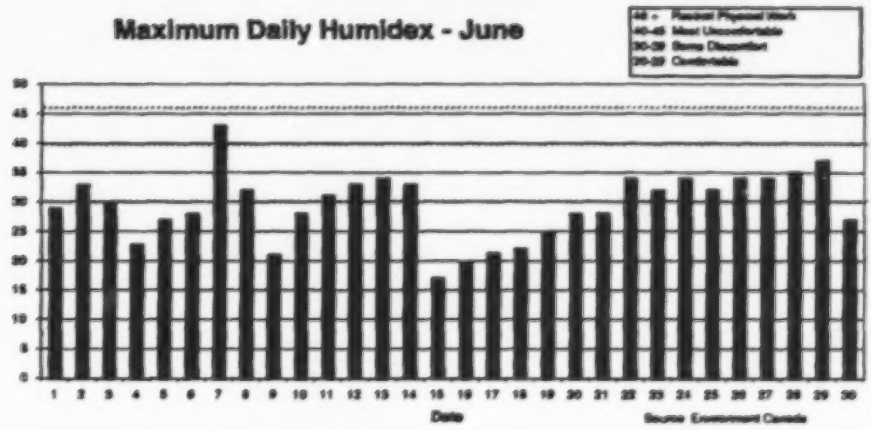
Note – No WBGT data available for May 99

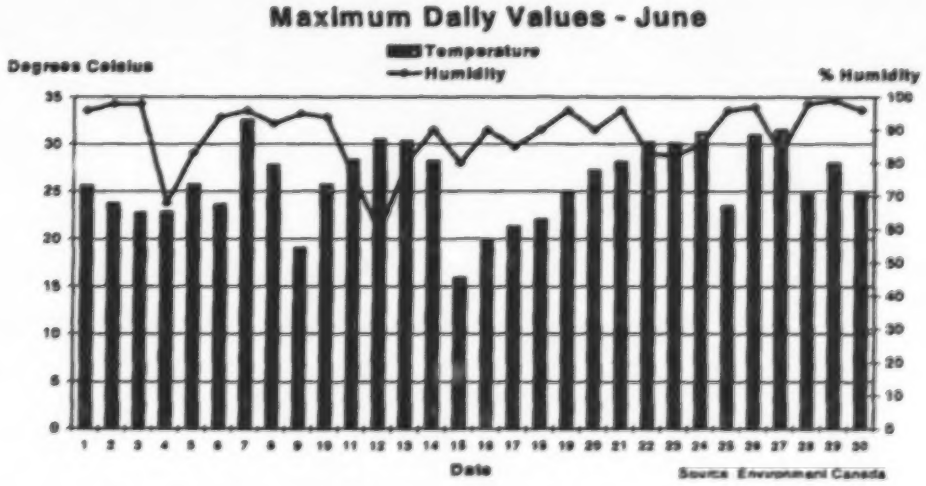




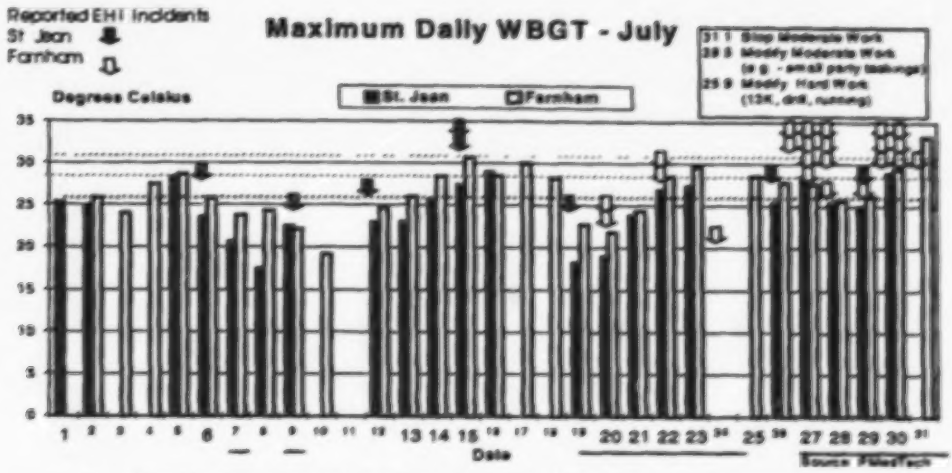
Environmental and Incident Data – June 1999



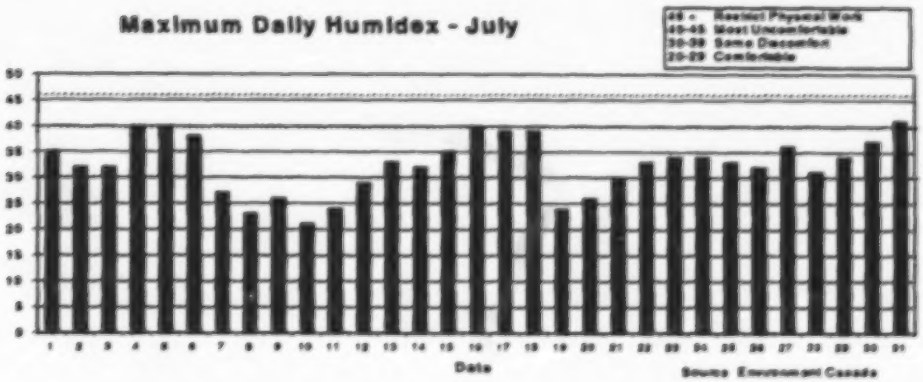


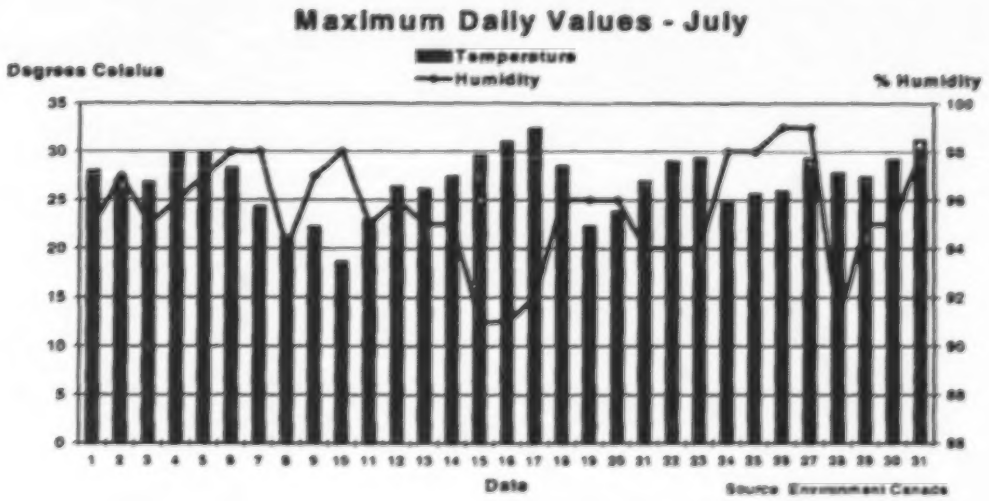


Environmental and Incident Data - July

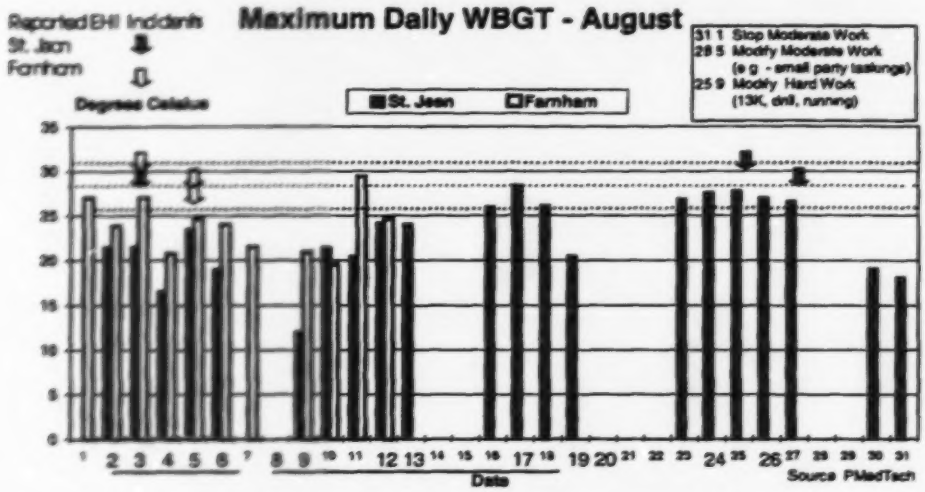


Large dates indicate questionnaire data collection. Underlined dates show when platoons were training in Farnham

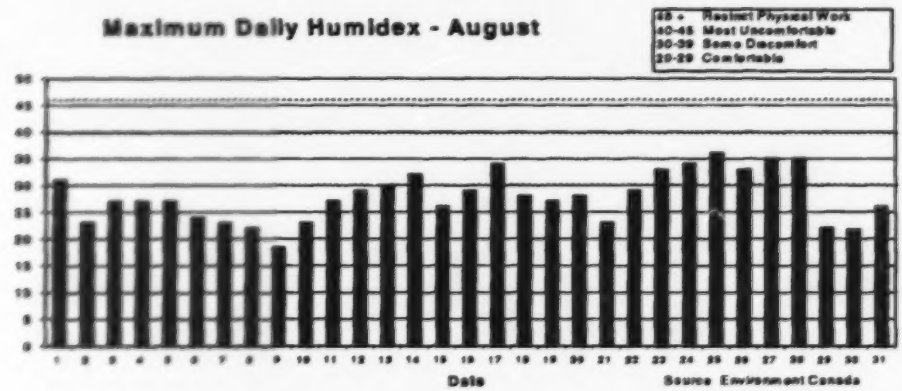


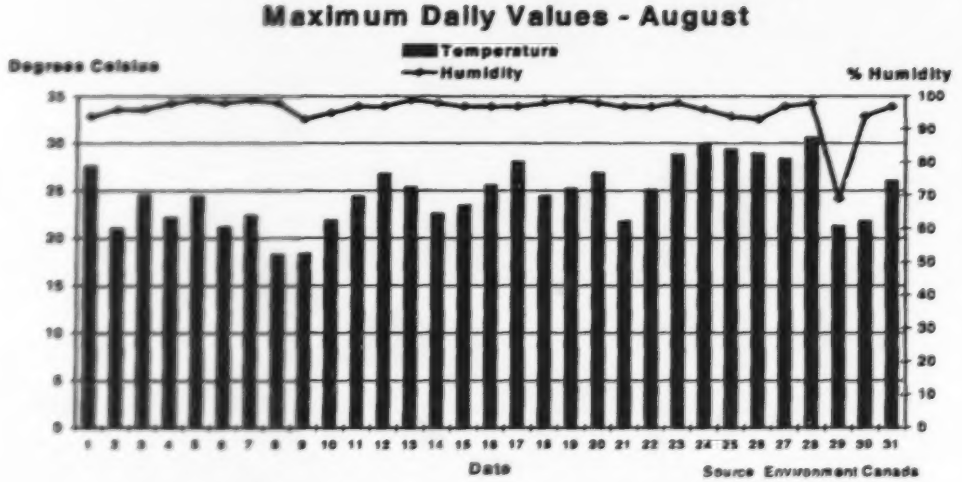


Environmental and Incident Data - August

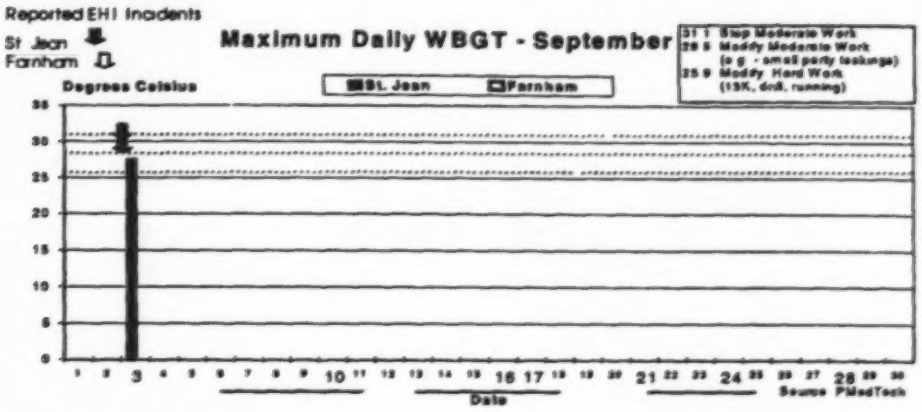


Large dots indicate questionnaire data collection. Underlined dates show when pictoons were training in Farnham.





Environmental and Incident Data - September



Large dates indicate questionnaire data collection. Underlined dates show when platoons were training in Farnham